The Implementation and Effective Use of Graphic Organizers in the Classroom:

Graphic Organizers to the Rescue

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Many students are faced with the daily routines and demands of reading complex, ambiguous, de-motivating text book materials which pose no significance to them, and in many situations, they are unable to derive meaning or make sense of what they have read. One of the many unfortunate circumstances that students with learning disabilities have to face daily include challenging tasks, which are comprised of: texts not being reader-friendly, text materials written above their reading and comprehension level, text which focuses on skills instruction in isolation, and, text which requires higher-level thinking and reasoning. This sometimes leads to frustration. Students with learning disabilities need to interact with the text and learning experiences that are embedded in real- world situations. In order to focus on the relevant information, and organize it in meaningful ways, they need that level of comprehenension, thus making information easier to understand and learn (Gagnon & Maccini, 2005; as cited in Maccini & Gagnon, 2008).

This is where the introduction and effective accomplishment of graphic organizers can be applied. In other words, educators can use graphic organizers to come to the rescue of students! (Dye, 2000). The main purpose of this strategy is to make complex materials easier to conceptualize and retrieve. Boudah, Lenz, Bulgren, Schumaker & Deshler, (2000) stated that these strategies "help students understand where they have been, where they are, and where they are going on the journey though the content" (p. 2). In summary, graphic organizers are like maps which direct students learning through the content materials, for better comprehension, and also in the acquisition of knowledge which therefore will become meaningful and memorable.

Graphic organizers, defined according to Lovitt (1994), "are diagrammatic illustrations used to organize and highlight content information and or vocabulary" (p.1). Maccini and Gagnon, (2008) summarized research on the topic and further elaborated on the terminology when they stated that "words and or phrases are used to connect the content information in a meaningful way to help students gain a clearer understanding of the materials" (p.1). The researchers' goals are to ensure that students receive meaning from the use of graphic organizer**,** which will then assist them in being able to represent problem situations, and being able to select the most appropriate operation needed to find a solution to any problem circumstance in subject areas such as mathematics, social studies and science.

Graphic organizers can be adapted to meet the academic demands of any group in an educational system; preschoolers, pre-kindergartens, elementary, middle and high school students. Students with learning disabilities are no exception; however, it is the teacher's onus to select the most appropriate strategy that suits individual level of understanding, the subject being taught, and how the needs of the class as a whole can be met. The teacher has to take into consideration the following factors in the selection of the most appropriate graphic organizers in order to meet the needs of her students. This includes the age level, academic functioning level, subject to be taught and the age appropriate graphic organizers, where the fundamental reasoning is to avoid frustration, but encourage meaningful, explicitly and fun learning (Gallavan & Kottler, 2007).

Research has suggested that when implementing graphic organizers, educators focus should be on the process of selecting the most effective strategy. This would be from the easiest or simplest method, then moving towards more complex; thus, ensuring the needs of each individual student is catered for and is met. Research has provided dynamic examples of graphic

organizers that can be used in all classrooms across the board, ranging from grade K to tertiary level education. Graphic organizers include (a) concept maps, (b) cognitive maps (c) semantic maps (d) story maps (e) unit organizers and (f) Venn diagrams, to name a few. As a result of this selection, educators' ultimate goal is that all students will be able to organize the information they have acquired, make connection to previous known information, then begin to interact with the text.

Researches have also provided empirical validated data for the efficient use of graphic organizers, as a tool which can assist students' performance in the different subject areas. For the purpose of this paper, the following three subjects were analyzed in relation to the everyday application and use of graphic organizers for both students and teachers:

1. The use of graphic organizers to improve the teaching of mathematics
2. The use of graphic organizers in the understanding of content in social studies
3. The efficacious use of graphic organizers in science

The Use of Graphic Organizers to Improve the Teaching of Mathematics

Over the years, the teaching of mathematics has been discussed as one of the most complicated content area of reading materials. Monroe (1997) acknowledges the statement "with more concepts per word, per sentence, and per paragraph than any other area" (as cited from Schell, 1982, p.544), thus making it more complex and difficult to conceptualize. Maccini and Ruhl (2000, as cited from Maccini & Gagnon, 2008) reiterated the previous author when they stated that children with learning disabilities have problems representing and solving problems. The problems that they encounter lies in the area of identifying key information, connecting relationship between broad concepts and details, and strategically approaching the solving of mathematical word problems. They further lack the skills in fluency with mathematics' facts

and solving basic mathematical procedures (Maccini & Ruhl, 2000 as cited from Maccini and Gagnon, 2008). Because of this predicament, educators need assistance in order to provide the most appropriate vocabulary instruction for students in mathematics. To ameliorate this problem, educators can provide intervention through the use of graphic organizers. Monroe (1997) explained, "its use may depend upon and existing schema for the concept under study" (p. 539).

Using graphic organizers can help children's understanding and can take various forms. According to Mendieta (2005, as cited by Coates, 2008), the use of graphic organizers including diagrams and semantic/content maps are examples of non-linguistic representations. These can be used to examine mathematical ideas, as well as to develop academic language for younger children with disabilities (Coates, 2008). Basically, these visual structures assist students in the organization of numerals, ideas, words and other information. The purpose of these strategies is to help focus students' emphasis on the identification of the key terms and concepts, which will enhance the final results of assigned task. In focusing on these strategies, students' prior knowledge in mathematics is activated, thereby aiding them in actively participating in the lesson on the topic under study. As educators, we realize that the demand for students improvement in mathematics is growing daily and at a constant rate. Students are required to:

- solve problems using numerals
- become fluent in computation skills
- identify number patterns
- gather data to create graphs with tiny to larger numbers
- solve equations using letters and numbers
- then communicate their understanding verbally and in writing (Coates, 2008, p.4)

How possible is it for students to complete such tasks when they have no idea or knowledge of how to move from one step to another? To further complicate the teaching of mathematics, there are no accommodations in place for these students to help them solve the complicated tasks involved in problem solving. What is in place to assist them in solving those high daily demands in mathematics? Although the understanding and process of mathematics concepts is a universal problem, these are some of the concerns for student with learning disabilities. The hope is that in the face of all these disenchantments, they will receive the required knowledge and skills which will help them become functional in their environment.

Diagrams, an example of graphic organizers, aid in the displaying of mathematical data, which can be used across grade levels. Coates (2008) and Ellis (2004) put forward a series of steps in which diagrams can be presented for early or young learners. First, the teacher gets the students prepared by informing them of the learning objectives and the expected outcome of the objectives. This is done to assist students in understanding how the graphic organizer is used, ensuring that they understand how the content of a topic is presented. Secondly, students observe while the teacher models the procedures or methods the steps entails. This stage is followed by guided practice. This stage can be carried out either in large groups or small group exercises, engaging students in meaningful learning, whereby they can learn from their peers. Lastly, independent work is done (with assistance when necessary), which should help with maintenance and generalization. However, teachers need to be aware and cautious that in using this strategy, it cannot consist of large groupings as students need to observe every stage of the concept process being taught. It is challenging for classes where there are many students, however, the main goal of the strategy is to aid students; in understanding the concepts taught.

Finally, Baxendrall (2003, as cited by Macinni and Gagnon, 2008) provided three examples of graphic organizers that can be used for effective teaching of mathematics to middle school students with learning disabilities. They include: hierarchal diagramming, sequencing charts, and compare and contrast charts. Hierarchical diagramming is the analyzing of the main topic in gathering of the overall information and then the sub-topics for supporting information. The main topic and sub-topic are connected with arrows, colors, lines numbers and phrases, which are done to show a connection of the hierarchy of the intended data to be displayed. In addition, when diagramming a general problem-solving strategy, the sequence charts can be applied. This basically represents an order for explicit and vivid images/events or procedure in content area, which is displayed through arrows that usually follow in one direction. The author also recommended that numbers be used for each step to show the flow of events and steps. The compare and contrast charts, highlight the differences and similarities across a set of items of two or three ideas**.** An everyday example commonly used in school is the Venn diagram. Baxendrall (2003, as cited in Maccini & Gagnon, 2008) strongly supported the use these three graphic organizers for middle school children in the classroom. He believes that they will assist students in organization and retention of information. He also noted that it should be taught consistently, coherently, and also in creative ways in order to help students acquire the intended information.

The Use of Graphic Organizers in the Understanding of Social Studies

Considerable evidence has proven that the teaching of many subjects overwhelms students, and the teaching of social studies is no different from mathematics nor science. Many students are of the conviction that the teaching of social studies is perplexing, and that the subject is not related to their contemporary world (Kottler & Gallavan, 2007). Therefore, the use of graphic organizers will be the appropriate teaching tool to help increase learning, make learning

meaningful, and maximizing the amount of time students remain engage in the process. Crawford and Canine (2000) reiterated, "graphic organizers help students sort, simplify, show relationships, make meaning, and manage data quickly and easily" (as cited in Gallavan & Kottler, 2007, p.117). Consequently, students' level of motivation increases, they recall information at a faster pace, and there will be greater long term achievement if the strategy is implemented effectively (Gallavan and Kottler, 2007).

With the effective implementation of graphic organizers, lessons will become genuine as students will begin to engage, and make connections between the ideas and concepts being taught. The use of the strategy in social studies empowers students to become critical, analytical, independent, and strategic learners. These characteristics aid them in being able to share information with peers, work sociably in groups, and make informative decisions, thus, leading to the achievement of the ultimate goals of social studies. According to Meyen, Vergason and Whelan (1996), graphic organizers are "visual displays teachers use to organize information in a manner that makes information easier to understand and learn" (as cited in Dye, 2000, p.1). For this purpose, there are many types of graphic organizers which may be used in the enhancement of social studies. As presented by Gallavan & Kottler (2007, p. 118-119) examples are as follows:

1. Assume and anticipate
2. Position and Pattern
3. Group and organize
4. Compare and contrast
5. Relate and Reason
6. Identify and Imagine

7. Estimate and Evaluate
8. Combine and Create

Chamont and O'Malley (1994, as cited in Hansen & Weisman, 2007) adamantly stated, "student must be able to learn much of social studies primarily through listening and reading ... if any, concrete referents" (p.181). They further reiterated that learning becomes difficult because visual cues or demonstrations are not given to support the learning and, as a result of this, the learning becomes complex, and meaningful learning is not taking place. The main aim of graphic organizers is to assist students in focusing on the critical aspects of concepts and contents with proper organization and summarization of the key concepts in order to see a vivid relationship and fosters creative learning. The goal then will be to make teaching and learning of the subject manageable and meaningful. Merkely and Jefferies (2000/2001) stated that when teachers incorporate graphic organizers into their planning, teaching and reflection repertoire, they become aware of the unlimited numbers of ways it can be applied. This effective strategy, of graphic organizers can be used individually, with peers or the general classroom environment.

The Efficacious Use of Graphic Organizers in Science

Many students enter the classroom with the pre-conceived notion that science is a difficult subject to conceptualize. To complicate the process, the teaching of science has always been viewed as a complex process which has to be taught by individuals who are scientifically inclined and enthusiastic about its teaching **(**Sorgo, 2006**)**. Added to these challenges, the science curriculum is plagued with the teaching-learning of abstract concepts, which includes testing and measurement, interpreting graph work, carrying out experiments and the worst phenomena - learning difficult formulas and codes such as the Periodic Table. Furthermore, the texts which are selected for the teaching learning process are not reader friendly; this was

reiterated by Kinniburg and Shaw (2007). The authors lamented the fact that the materials that are used for the teaching and learning of science have difficult vocabulary and puzzling explanations for concepts, thus, further complicating the child's need to comprehend.

The teaching of science involves a logical sequence of delivering and conceptualizing information. As a result of this, students with learning disabilities who already lack the ability to analyze and interpret the content given to them become more disoriented. Therefore, the tasks become overwhelmingly difficult, which then leads to frustration. Science is the world we live in, and the classroom environment creates lots of opportunities for the exploration of authenticity. Because of this, students need to be motivated; and the teaching approaches should be done differently in order to get rid of the negative stigma which makes it difficult for students to achieve and make the learning fun. Children need to understand that we live in the world of science, and it is all around us. It is therefore the role of educators to help change this dilemma, and graphic organizers are excellent teaching- learning tools that can assist students in the organization of scientific information (Ellis, 2004; Sorgo, 2006).

Kinniburg and Shaw (2007) proposed the use of Readers' Theatre to assist students in getting meaning out of the text. The strategy was developed as an efficient and effective way to present literature in a dramatic form. Kinniburg and Shaw (2007 stated that "Reading Theatre assists students with the difficulty of the vocabulary and concepts and help them become fluent readers of science content materials" (p.16). The authors further stated that because of the complex nature of the academic vocabulary and unambiguous explanation of many concepts in the teaching of science, students will not be able to derive meaning, if they cannot read to understand. They surmise that the use of this strategy brings "science content to life and are more motivating to students than simply reading from their science text or trade book" (p. 19).

The No Child Left Behind Act mandates that science knowledge and skills be tested (Kinninburg & Shaw, 2007). By making effective use of this graphic organizer, teachers are empowering students to master subject-matter faster and more efficiently. Because of the many benefits and functions which can be derived from the use of graphic organizers, educators should apply it in the everyday classroom. Kinninsburg and Shaw (2007) further reiterated this idea by stating that: "the more students understand that reading in the content area of science can be a learning adventure, the more they will develop a love for the subject, rather than seeing it as another boring textbook chore" (p.19).

Concept or semantic maps are visual strategies that distinguish the relationship among concepts. Shmaefsky (2007) strongly stated that the use of concept maps assist students in the acquiring of scientific information which will help them in classifying ideas. These ideas are then communicated through the application of skills. Wolfinger (2006) reiterated Shmaefsky's point, when he said**:** "concept maps have an advantage over popular method of pre-assessment such as pretest, interviews, and group discussion ... because they provide a written record of the students' ideas"(p. 48). The strategy aids students in the conceptualization and retention of meaningful, authentic information. The author further stated "concept maps promotes creativity and flexibility because it places facts in the construct of the students' learning modality" (p.48). In other words, concept maps activate students' prior knowledge, and as a result make students understanding less complicated, thus enhancing meaningful learning. This learning can then be maintained and generalized in their everyday environment. Because of the visual nature of concept mapping and the method of its application, this training tool can be an effective teaching learning strategy which can assist students in the science classroom to make learning more meaningful and productive.

Graphic organizers "reduce the cognitive demand on the learner" (Ellis 2004, p.1). In other words, the information that has to be processed becomes less complicated and easier to grasp thereby allowing the child to concentrate on the essential information, and not on the text or the information which look foreign or ambiguous. Consequently, it becomes much easier for the students to retain the information presented. The ultimate long term goals of educators are for students to understand and apply whatever they have learnt, hence, making the learning evocative. The teaching of science entails discovery of ideas, skills, and concepts which is done through the use of experiments and investigations which have to be analyzed. When students are comfortable at what they do, they become motivated, and this motivation leads to a high level of confidence, which makes them want to inquire and become more knowledgeable. They become goal-oriented, and then begin to generalize learning from one environment to another, more proficiently**.**

Hutchison and Padgett (2007) summarize "great teaching is artful when students get information into their memory in an organized fashion to facilitate later retrieval" (p.69). Because of the way information is presented in graphic organizers, it is achievable. Although science is a complex subject, the continuous use of the strategy can achieve inconceivable gains and, in the process, help simplify the learning process. Furthermore, the consistent use of the graphic organizers will assist students in overcoming the fear of the subject, as well as help them discover ideas and meaning, thereby building their motivation; learning will become meaningful and enjoyable in the application and generalizing process provided by the use of graphic organizers. Children will then begin to develop a higher order level of thinking and analyzing. There are many advantages from the use of graphic organizers strategy; therefore, teachers should encourage its use in their classrooms to ensure that all students become proficient in the

use of this strategy so that they will make maximum use of information under study. Information can be presented either orally or visually, because graphic organizers are multi-faceted strategies which engage students in the learning of science. “A graphic organizer is only as powerful as it creators is capable of making it clearly capture the fact” (Hutchinson & Padgett 2007, p. 72).

Discussion

This literature review paper has proven that “graphic organizers serve as retrieval cues for information, and also they facilitate higher learning thinking” (Clarke, 1991; Dunstan, 1992, as cited in Monroe, 1997 p.539). A hindrance for its effective application may depend on the level of the learner’s maturity; that is, the extensive use of it is mainly appropriate for students who have sufficient cognitive development to engage in abstract thinking (Monroe, 1997). Graphic organizers are instrumental in improving learning outcomes, despite the level of the learner’s cognitive development, instructional activities in use, level of maturity of students, students learning styles and also the past experiences of each individual learner. The literature indicated that when students are taught through the effective development and use of the strategy, it assist them in “organizing information to be learned, connecting it to what is known, and allowing the reader to interact with the intended information or text” (Dunstan 1992, as cited in Monroe, 1997, p.59).

However, for this strategy to be implemented effectively and to accomplish maximum gains, educators need to be knowledgeable in its development, application and use. The end product should be students motivated, being able to process the new information, and completing previously complicated task. These are the maximum gains which can be achieved from its effective implementation. In short, teachers should be equipped with knowledge about the

strategy in order to apply it in their classrooms. Because of the maximum benefits that can be derived from this multi-faceted strategy, its implementation should be applied across all subject areas, and in particular mathematics, social studies and science content. This is in order to meet the individual needs and difference and learning styles of each person as a unit and the class as a whole.

As educators, if we review the history of mathematics we would have noted that there were several distinguished mathematicians and scientists in the likes of Einstein and Wolfram, who encountered difficulties in knowing simple basic mathematical skills, such as memorization of basic facts and rote application of algorithms(West, 2000, as cited in Ives, 2007). This same pattern has continued to reoccur with students with disabilities, and in particular high school students. These students may be able to compute and complete abstract concepts, but the basic everyday tasks are difficult for them to compute. As a result of this, teachers and researchers began to explore various instructional methods which will assist student's complete day to day tasks in mathematics.

To these students' rescue is the application of graphic organizers. It assists them in differentiating between different types of mathematical problems and also able to match problems type to particular schema diagram as guide to solving their problems (Ives 2007). Graphic organizers in mathematics also "lend itself to having students create, manipulate, visualize, record, recall, and express understanding of concepts. It further activates the learners' cognitive skills, while at the same time triggering the use of tactile and visual abilities to make sense of information" (Lubin and Sewak, 2007, p.14).

Additionally, graphic organizers cater for the social studies environment. Educators were concerned with the overwhelmingly nature of the subject content and as **'**a means to an end',

needed a way to assist students. It helps students sort, simplify, show the relationships, make meaning, and manage data quickly and easily (Canine & Crawford 2000, as cited in Gallavan & Kottler, 2007). Gallavan and Kottler (2007) further stated that "graphic organizers are visual models, which provide teachers with tools, concepts, and language to organize, understand, and apply information to achieve a variety of purposes and outcomes" (p.117).

Because of the effective implementation of the strategy, the literature has been very encouraging when it indicated that "students become more motivated, demonstrated faster short-term recall, and show greater long-term achievement when organizers are used effectively in social studies content" (Deppell 2005, as cited in Gallavan & Kottler, 2007 p.117). The literature review also indicated that graphic organizers, as a result of its continuous use, has empowered students to take responsibility for their own learning and, even when the tasks are demanding, students tend to remain motivated and focus on the task ahead. This motivational tool has continued to assist students become actively involved in the learning, thus leading to greater understanding and sharing of information with their peers.

Furthermore, the use of graphic organizers in science in the everyday classroom setting complements each other. It is a strategy "that the literature has revealed that educators have used to condense content to produce great improvement in the acquisition as well as the maintenance and generalization of concepts" (Lubin & Sewak, 2007, p.14). Teachers at the middle school and high-school level seem to benefit the most from the implementation of the strategy. Because of the opportunity to present complicated information in a meaningful way, it will assist students in the retention, and easy retrieval of the information.

It also assists in helping make learning fun. Because of this, it leads to less frustration, active student involvement and participation, and an outstanding level of performance. This is

an indicator that the learning instruction is being effectively implemented, hence leading to maximum gains and positive outcomes for all students. In short, the use of graphic organizers in the teaching/learning of science and social studies assist students in getting meaning out of the text, keep focus on the key information, then identify the relationship between the ideas.

Finally, there are multiple benefits to be derived from the implementation of graphic organizers in the everyday classroom, across all subject level, students' age and learning modalities. Because of the effective nature of graphic organizers, it should be implemented and used in particular with children with learning disabilities, at the high-school level; not implying that lots of emphasis should not be on students at the lower level. This is evident because as students get older, the task becomes more overwhelming and complicated, thus leading to frustration and effective learning not occurring. The use of graphic organizers, with students learning disabilities will be able to acquire the intended knowledge, become proficient users, maintained what they have learned and then be able to make generalization with what they have learned, across settings.

The use of the strategy has been proven effective by countless scientific, empirically validated research, literature reviews, teachers and even students. It can cater to individual differences, ages, ability, and learning modalities. It also improves a student's level of comprehension, knowledge comprehension and also the application of knowledge. It has been proven particular successful for students with learning disabilities at high school level. Because of all these benefits, graphic organizers can be called the 'savior' of students with special needs.

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