Revisiting Brainstorming Within an Educational Context: A Meta-Thematic Analysis

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Abstract: An increase in research on the teaching of creativity in learning environments is being witnessed as more studies continue to reveal its effects on learning outcomes and academic achievement. Thus, any investigative attempt to examine the relevant approaches to teaching of creative thinking skills is appreciated within the creativity literature. However, it is evident that the research on brainstorming as a creativity-promoting technique within an educational context has been overlooked for a while. Therefore, this research synthesis tried to recombine and reinterpret the results of some qualitative studies on the impacts of brainstorming technique on learners' achievement. To this end, 34 studies within the relevant literature were scanned; however, seven of them were found to be conducive to the meta-thematic analysis. The results of the meta-thematic analysis suggest that the brainstorming technique has positive effects on learners' cognitive skills and affect. It is believed that designing instruction with brainstorming could foster students' creativity by directing them to solving problems via critical thinking. The study further dwells on the reported drawbacks that are encountered during the implementation of this technique within the classroom and discusses some possible solutions as implications.

Keywords: academic achievement, brainstorming, creativity, meta-thematic analysis, thinking skills.

Introduction

Creativity is enunciated to be given high priority as one of the key competencies of the 21st century in every sphere of life, particularly in education (Hernandez-Torrano & Ibrayeva, 2020; Bonnardel & Didier, 2020; Nakano & Wechsler, 2018; Gajda et al, 2017; Tsai, 2013; Trilling & Fadel, 2009; Craft et al, 2007), replacing intelligence as the focus of interest (Parkhurst, 1999). Along with the paradigm shift in contemporary learning theory towards more constructivist and social cognitivist approaches, there has been an ever-increasing inclination to incorporate creativity and its required skills into many a school curriculum throughout the world (Shaheen, 2010). The reality that the development level of any country is now determined with its level of information and technology within the context of globalisation acts as an incentive for many countries to try to reconsider their education systems in this respect (Shute & Ventura, 2013). The findings of this attempt encourage those countries to carry out research for improving individuals' creativity. However, creativity alone cannot show its full impact. Therefore, individuals are required to develop problem solving and divergent thinking skills together with creativity (İslim, 2011; Scott et al, 2004).

Although elusiveness is mentioned as regards the commonality of a standard definition of creativity by some researchers (Runco & Jaeger, 2012; Cropley, 2001; Parkhurst, 1999; Ford & Harris, 1992), Parkhurst (1999) proposes a definition, which encompasses problem-solving but is not confined merely to it, as, "The ability or quality displayed when solving hitherto unsolved problems, when developing novel solutions to problems others have solved differently, or when developing original and novel (at least to the originator) products" (p. 18). No matter what other components creativity may contain depending on various theoretical definitions, learning and its targeted outcome, academic achievement is clearly correlated with creativity (Gajda et al, 2017). Therefore, any investigative attempt to reveal what teaching strategies could best foster creativity within classroom settings would be a significant contribution to the research on creativity in education. To this end, we tried to reconsider the brainstorming technique, which we believe has been neglected over a decade or so within the educational context.

Literature Review

Instructional strategies and techniques occupy a significant part of the teaching process for educators as regards the quality of teaching. It is not always easy for teachers to identify the best methods of facilitating students' active learning; thus, when considered in this context, brainstorming stands out as a thinking strategy that fosters creativity and that is utilised by individuals for solving problems easily (Isaksen & Gaulin, 2005; Şahin, 2005). Its first use appeared in the advertising sector with the aim of increasing product sales by generating many ideas and determining the best ones. Since a great number of different and new ideas are brought forward, it is also known as a "questorm" (Demirel, 2007). Brainstorming renders learners' minds active, thus, facilitating the reconstruction of knowledge. Hence, one of the techniques enabling the retention of knowledge in this regard is brainstorming (Alım & Gül, 2011). Apart from its semantic dimension obtained during the teaching-learning process, the positive change in learners' behaviours is the most important aspect of this technique for teachers. Brainstorming in this regard is a teaching technique which places learners in the centre and which is based on ready communication of any ideas without fear of being criticised (Putman & Paulus, 2009); it also makes learners experience a feeling of success and helps them develop skills of creativity and form positive attitudes towards the lesson (Yaman & Karaarsalan, 2012).

One definition of brainstorming is enabling participants to deal with a problem or a subject matter and produce as many ideas as possible during an implementation process without bothering to compare their ideas (Saban, 2004). When viewed from this aspect, the number of generated ideas is invaluable. The aim with an abundant number of produced ideas is to show that participants have to offer multiple solutions via their imagination about the existing problem. It is thought to be more effective to make use of the brainstorming technique for explicating a problem or a subject matter. Students can improve their problem-solving skills by interacting with group members within groups at school to create novel ideas. The utilisation of this technique could contribute to the learning process as it helps the students in a group become active in an activity by prompting their creative thinking processes and rendering the learning environment more attractive (Yalavuz, 2006). The longer students keep active with the brainstorming technique, the more their capacity for coping with any complex and difficult problem will be enhanced. Any group directed to creative thinking is always the one that gives importance to inquiry learning. The group members search for solutions to a problem by way of idea generation (Özerbaş, 2011).

The first task to be accomplished during the implementation stage of a brainstorming session is to identify the problem case. A recent meta-analysis shows in this respect that identification of problems is significantly correlated with creativity (Abdulla et al, 2018). This case should be defined as a question to stir the participants' reflective power. The instructor designates the group according to its characteristics. A chairperson and a secretary are chosen among volunteers. The chair of the participant group is to prompt the group by leading it with a statement about the problem. If it is implemented within a classroom, the instructor's own positive introduction to the topic in the first place could encourage students. The students pursue the process later by articulating all the ideas which they come up with about the problem. The secretary student directly writes down all the ideas which are generated. An extension of time may be granted upon the expiry of the time given for notetaking. After the notetaking procedure is completed, within a specified period, an assessment of the ideas determined within the group will proceed. Upon the consideration of the positive and negative aspects of every idea, a significance level ranking will be conducted accordingly. All qualified ideas originated at the end of the implementation of this technique are brought up for discussion with the orchestration of the instructor (Özerbaş, 2011). The implementation during the activities carried out for brainstorming may vary between 15 and 45 minutes according to the kind of subject and the number of participants. An extension of time could happen for the duration of implementation of this activity, as the occasion requires. It is thought that selecting members as those knowing and those not knowing the problem compositely while determining a group will be more efficient; since the ideas produced by those who have knowledge about the problem vary from the ones produced by those who do not know the problem and could increase the impact of a solution (Selvi, 1999).

Most educators think that creativity is a natural characteristic unique to every individual, and, thus, may vary from one person to another, as it is affected by experience and genetic factors (Woolfolk, 2018; Slavin, 2017). Although it depends on individual traits, what exactly matters is how this characteristic of creativity could be discovered and developed (İslim, 2011). It was observed in some research studies that interactive groups compared to groups composed of the same number of individuals working individually produce quantitatively fewer ideas. The reason for this might be students' fear of negative evaluation of one another (Isaksen & Gaulin, 2005). Thus, none of students' ideas should be interrupted during the activity (Duru, 2009). The brainstorming technique helps participant individuals develop their skills of listening to, showing respect to and judging others' thoughts within a group. Indeed, McMahon et al's (2016) study reveals that group brainstorming provides us more than mere idea generation, in that it fosters creativity and some other aspects of idea development, like the possibility to combine resources and disseminate expert knowledge. However, some problems such as quick evaluation, fear of making mistakes, personality barriers, lack of knowledge, and obligation of thinking within a certain form may arise during the implementation of this technique. Therefore, resolving these problems will facilitate reaching fruition (Şahin, 2005). For individuals to discover their creativity, the classroom environment should be arranged in such a way as to let them easily share their ideas. Nevertheless, in-class arguments of ideas are generally not welcomed by teachers. The reason for this is the fact that the ideas put forward by the students told to do so are unexpected ones (İslim, 2011). If the brainstorming technique is implemented efficiently from the first stages of schooling, it could make a positive impact on learners' creative thinking and problem-solving behaviours (Şahin, 2005).

Purpose of the Study

The need for information is ever increasing in our constantly evolving lives. Humanity's curiosity for learning and the globalising world order has rendered the generation of novel ideas and technological innovation as two intertwined requirements. Accordingly, what is expected from today's educational approach is to be able to bring up creative individuals who have adopted the progressivist philosophy of education, and thus can think alternatively and critically and who are learning to learn. Hence, such instructional techniques as brainstorming are of vital importance in order to achieve the afore-mentioned anticipated goal, which makes this study investigating the effect of brainstorming on academic achievement a significant contribution to the literature as it reports with a synthesis of the first-hand views from some relevant qualitative studies. Moreover, brainstorming in an educational context is often taken for granted, and has recently been overlooked within creativity research. A study by Williams, Runco & Berlow (2016) mapping the research on creativity in the past 25 years reveals a downward trend, with increasingly less research in terms of brainstorming. Therefore, we strongly believe that revisiting brainstorming in educational settings will provide a small but important step to promote a revival of the empirical research on this topic.

This study aimed to reveal the effect of brainstorming technique on academic achievement. To this end, three different themes were formed by use of the meta-thematic analysis method. The relevant sub-problems addressed within the analysis are as follows:

1. What are the effects of the brainstorming technique on cognitive skills?
2. What are the effects of the brainstorming technique on affective skills and behaviours?
3. What are the problems encountered during implementations?

Methods

The qualitative research paradigm was preferred in order to conduct the present study. Qualitative research is claimed to be necessary for accomplishing the purposes of evidence-based research, as it has a unique potential for reaching aspects of human experience which cannot be reached via quantitative methods (Sandelowski, Voils, & Barroso 2006). Thus, it was intended to obtain general results by examining the qualitative data within the framework of a meta-thematic analysis. The study adopted a meta-thematic analysis method, a kind of content analysis used within the qualitative research design. The meta-thematic analysis studies are the ones in which qualitative research studies on any specified subject-matter are examined under certain common themes with a critical perspective, and some comprehensive and qualified findings are reached as a result (Batdı, 2019a, b).

Selection of Studies

Within this context, we decided to make an overall re-examination of the effect of the brainstorming technique on learners' academic achievement and, therefore, included relevant qualitative research studies containing participants' views. Content analysis is apprehensible in conveying similar data combined within the frame of specified themes (Çalık & Sözbilir, 2014). The reason for choosing meta-thematic analysis in the present study was the aim of identifying and examining the similarities and differences of the relevant studies on the targeted subject. In this context, to access national studies conducted with qualitative research methods during the period of 2008-2020, searches were carried out from the YÖK National Thesis Center and Google Scholar search engines with keywords, such as

"the effectiveness of the brainstorming technique, brainstorming, brainstorming and achievement/learning". Within the literature search, 34 studies were reached. However, in order for the studies to be included in the meta-thematic analysis, they must comply with the criteria such as, "studies that examined the effectiveness of the brainstorming technique; that contain data based on participant views; that were carried out with a qualitative method; that can be scanned from specified databases; and that collected data with qualitative data techniques such as interview/observation". In line with these criteria, it was understood that only seven of the studies met the inclusion criteria, and thus were appropriate for meta-thematic analysis (i.e., Gül, 2013; Güven, 2013; Karasu-Avcı & Kayabaşı, 2018; Vural, 2008; Yaman & Karaaslan, 2012; Yılmaz, 2017; Yiğitalp, 2014).

Analysis of Studies

In the present research, the data collected through document analysis to determine the effectiveness of the brainstorming technique were analysed using the Maxqda-11 qualitative data analysis programme. Since the coding process of the data can be done both manually and with a computer programme (Merriam, 2009), and since there are very comprehensive and powerful package programmes, the analyses of the current research were conducted with the help of the package programme. After scanning the studies from the relevant data bases, the theses were coded with their thesis number and the page number of the codes (i.e., Kt1-p. 105); the articles with their journal article numbers and the page number of the codes (i.e., DM2-p. 65). The codes within this scope were collected under three themes (cognitive skills, affective skills and behaviours and problems encountered). Within the scope of the meta-thematic analysis of the research, codes and themes were created by performing inductive analyses. For this, first of all, the qualitative data in the studies related to the brainstorming technique were determined based on participant perspectives. After the word-by-word analysis with open coding (Khandkar, 2009), the concepts found to be appropriate with axial coding (Strauss & Corbin, 1998) were recorded separately to create the relevant theme. Afterwards, all the concepts (codes) determined were examined in detail and the codes that were identified as being related and consistent with each other were clearly specified by the stage of 'selective coding' (Charmaz, 2006). After the identified fixed codes were given their final form expressively, the reliability of the codes was also checked.

Validity and Reliability

To ensure the validity and reliability of the study, we made sure that the inter-consistency and meaningfulness of the codes and themes constituted an integrity for providing coherence of the findings. To this end, we calculated the Cohen's Kappa statistic to measure the inter-rater reliability (Yıldırım & Şimşek, 2013). As a result, the agreement value intervals were found to be between .835 and .914 as "almost perfect agreement" (Viera & Garrett, 2005), (see Appendix 1). In addition, to ensure the reliability of qualitative research, it is known that expert examination contributes to the credibility of the research in terms of interpreting the data correctly and obtaining sufficient results (Cresswell, 2003), thus, we would like to state that, in the current study, an independent researcher, who has done qualitative research and thematic analysis in his studies, was asked to evaluate the process and we exchanged views with him to evaluate every stage of the research. Necessary arrangements were made in the research within the framework of mutual opinions. In addition, in the meta-thematic analysis, direct quotations from the studies that were the source for forming the themes and codes contributed to the reliability of the research as well. In this sense, Sutton and Austin (2015)

state that all the conclusions drawn by researchers should be supported by the direct quotations of the participants. In this way, it should be clearly understood by the reader that the themes discussed were actually obtained from the interviews with the participants and not from the researcher's own perceptions.

Findings

Findings Regarding the Efficiency of Brainstorming

It was intended to obtain more in-depth and effective findings with the use of the meta-thematic analysis method within the present study. In this part, the findings that were obtained with the meta-thematic analysis method based on document analysis are presented and interpreted. The themes and codes which were formed as a result of some analyses are presented with models. It is seen that the codes are grouped under three themes and visualised in three models (Figures 1, 2 and 3). These themes are, respectively, given below as, "the effects of the brainstorming technique on cognitive skills" (Figure 1), "the effects of the brainstorming technique on affective skills and behaviours" (Figure 2), and "the problems encountered during implementation" (Figure 3). Figure 1 presents the theme, "the effects of the brainstorming technique on cognitive skills", and relevant codes that were formed under this theme from the participants' views are given in the figure.
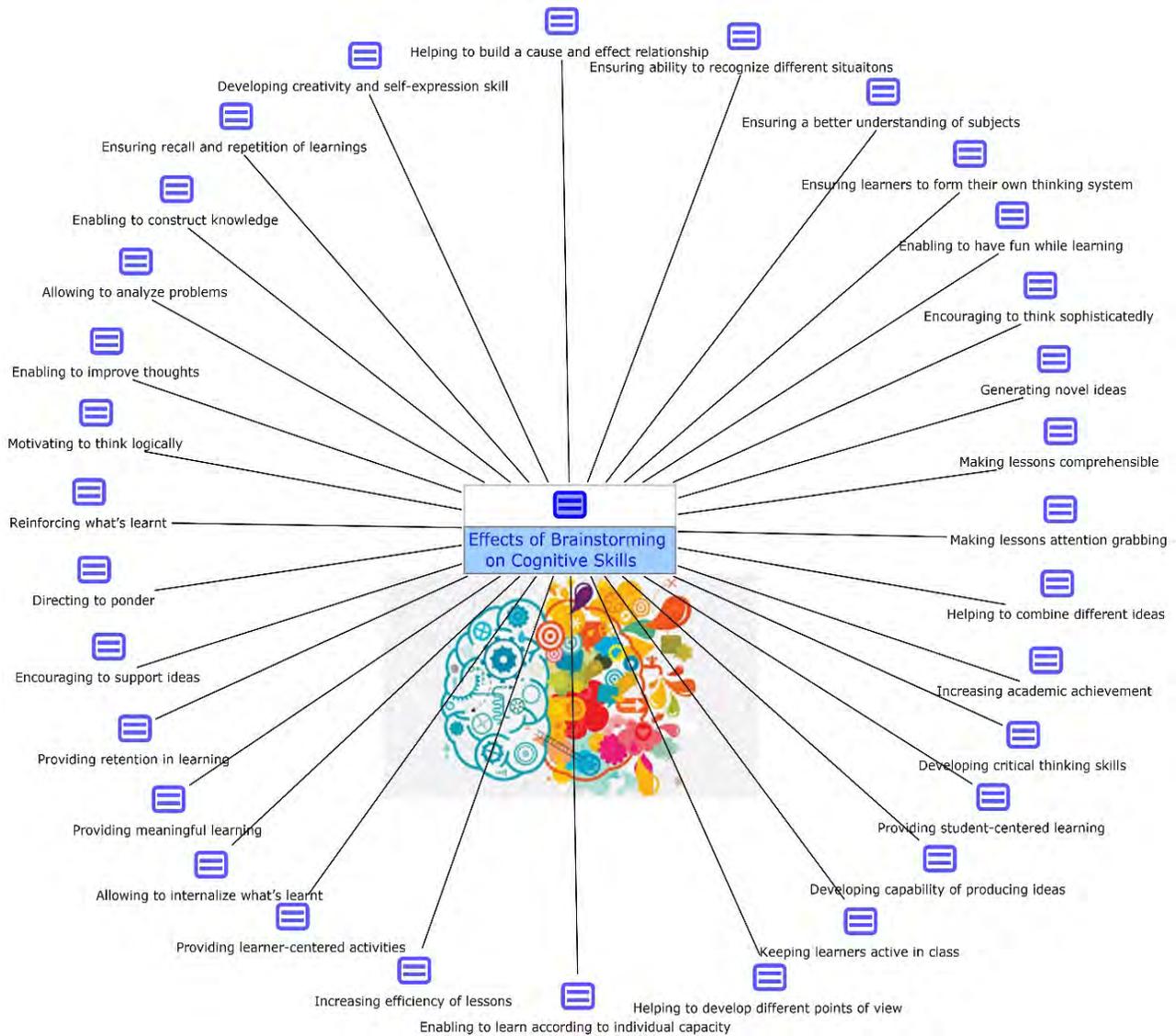
Helping to build a cause and effect relationship

Ensuring ability to recognize different situaitons

Developing creativity and self-expression skill

Ensuring a better understanding of subjects

Ensuring recall and repetition of learnings

Ensuring learners to form their own thinking system

Enabling to construct knowledge

Enabling to have fun while learning

Allowing to analyze problems

Encouraging to think sophisticatedly

Enabling to improve thoughts

Generating novel ideas

Motivating to think logically

Making lessons comprehensible

Reinforcing what's learnt

Making lessons attention grabbing

Directing to ponder

Helping to combine different ideas

Encouraging to support ideas

Increasing academic achievement

Providing retention in learning

Developing critical thinking skills

Providing meaningful learning

Providing student-centered learning

Allowing to internalize what's learnt

Developing capability of producing ideas

Providing learner-centered activities

Keeping learners active in class

Increasing efficiency of lessons

Helping to develop different points of view

Enabling to learn according to individual capacity

Effects of Brainstorming on Cognitive Skills

Figure 1: Effects of brainstorming on cognitive skills

Figure 1 models the codes related to the theme, "effects of the brainstorming technique on cognitive skills". Some of the codes are given as "making lessons attention-grabbing, developing critical thinking skills, providing meaningful learning, enabling one to look at things from different perspectives, reinforcing what's been learnt, providing retention in learning, ensuring recall and repetition of learning, keeping learners active in class, increasing academic achievement, enabling the generation of ideas based on daily life experiences". Some statements taken as references while forming the codes are from Kt1-p. 87, "Some improvements that I have observed in my child at the end of the activity are as follow: Asking different questions and making interesting comments, an increase in 'I wonder..?' expressions, driving us into a tight corner with 'what if not..?', 'I wonder if it's so?' expressions"; and from Dm3-p. 503, "the teacher started the lesson by asking questions related to pressure in solids, and then reinforced the subject-matter by using the brainstorming technique"; and from Dm4-p. 38 "…the child becomes active in the process of reaching information and learning,

and enjoys this. Thus, the learning becomes permanent." When these statements are carefully considered, it could be suggested that the brainstorming technique is closely related with the Intellectual Skills and Cognitive Strategies domains of Gagne's conditions of learning model (Gagné, 1985). Cognitive strategies allow learners to gain higher-order skills. Since brainstorming develops individuals' higher-order thinking skills, it is highly advisable to make use of it from earlier stages of schooling. The utilisation of this creative thinking technique also contributes to the affective domain of learning as it is modelled in Figure 2.
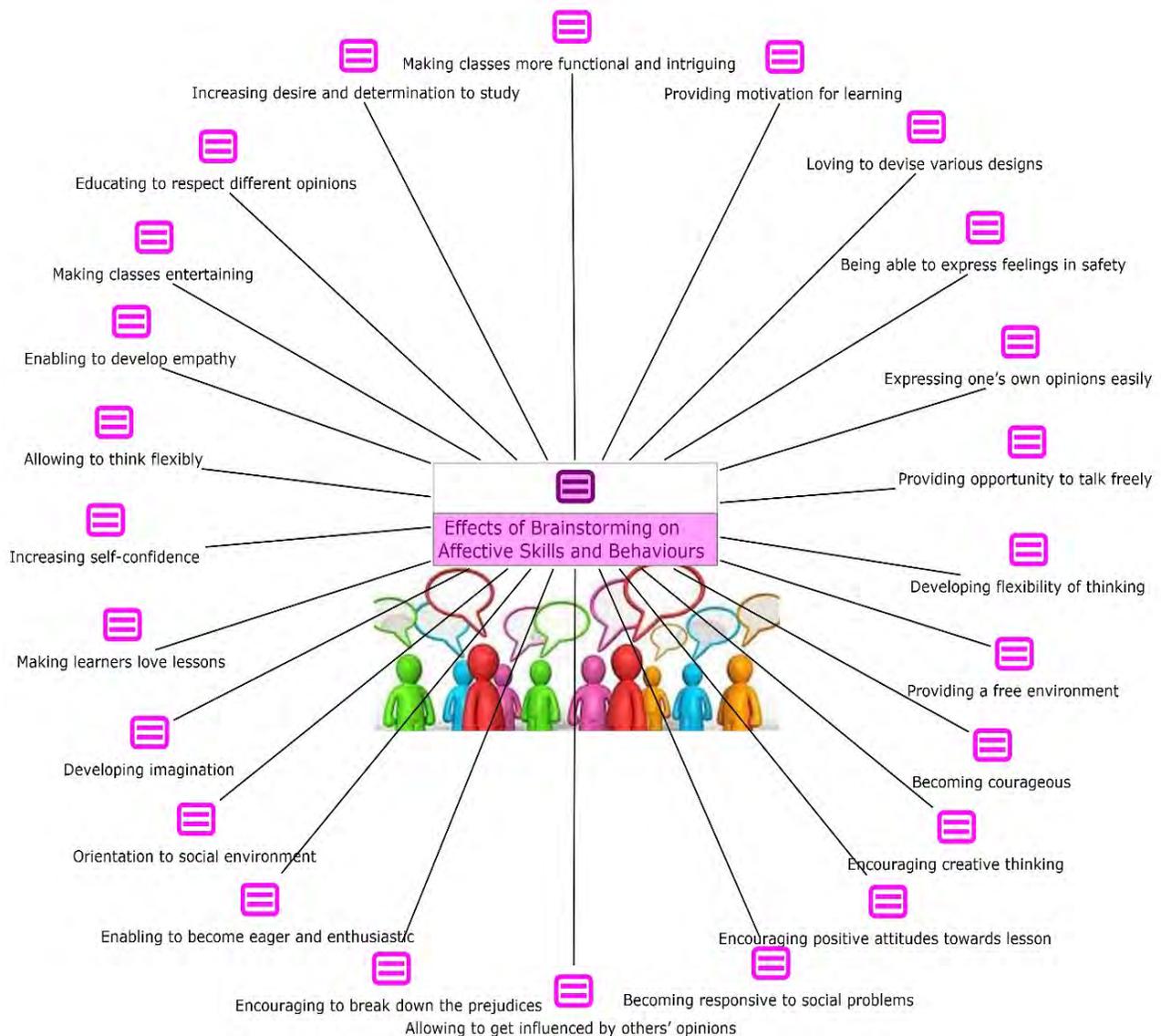
Figure 2: Effects of brainstorming on affective skills and behaviours

Figure 2 presents the model which contains the codes related to the effects of the brainstorming technique on affective skills and behaviours. An activity based on brainstorming is a process involving not only cognitive but also affective elements; thus, the present study tried also to identify the emotional responses individuals showed as a result of the implementation of brainstorming. Some

of the codes are determined as, "educating to respect different opinions, becoming courageous, developing empathy, increasing self-confidence, becoming responsive to social problems, orienting to social environment, and encouraging positive attitudes towards lessons". Some statements taken as references while forming the codes are from Dm1-p. 10, "It can keep student participation high, it appeals to most students, it is suitable for students' level and classroom time"; and from Dm4- p. 40, "… it motivates children and allows them to learn faster", and from Kt3-p. 67, "My Geography course is better this year than previous years, I understand better and love Geography more''. When the relevant codes are considered in detail, it is observed that, after brainstorming activities, students develop positive attitudes towards lessons, they learn to respect each other, and they have increased self-confidence. However, some problems were witnessed during brainstorming activities as it is modelled in Figure 3.
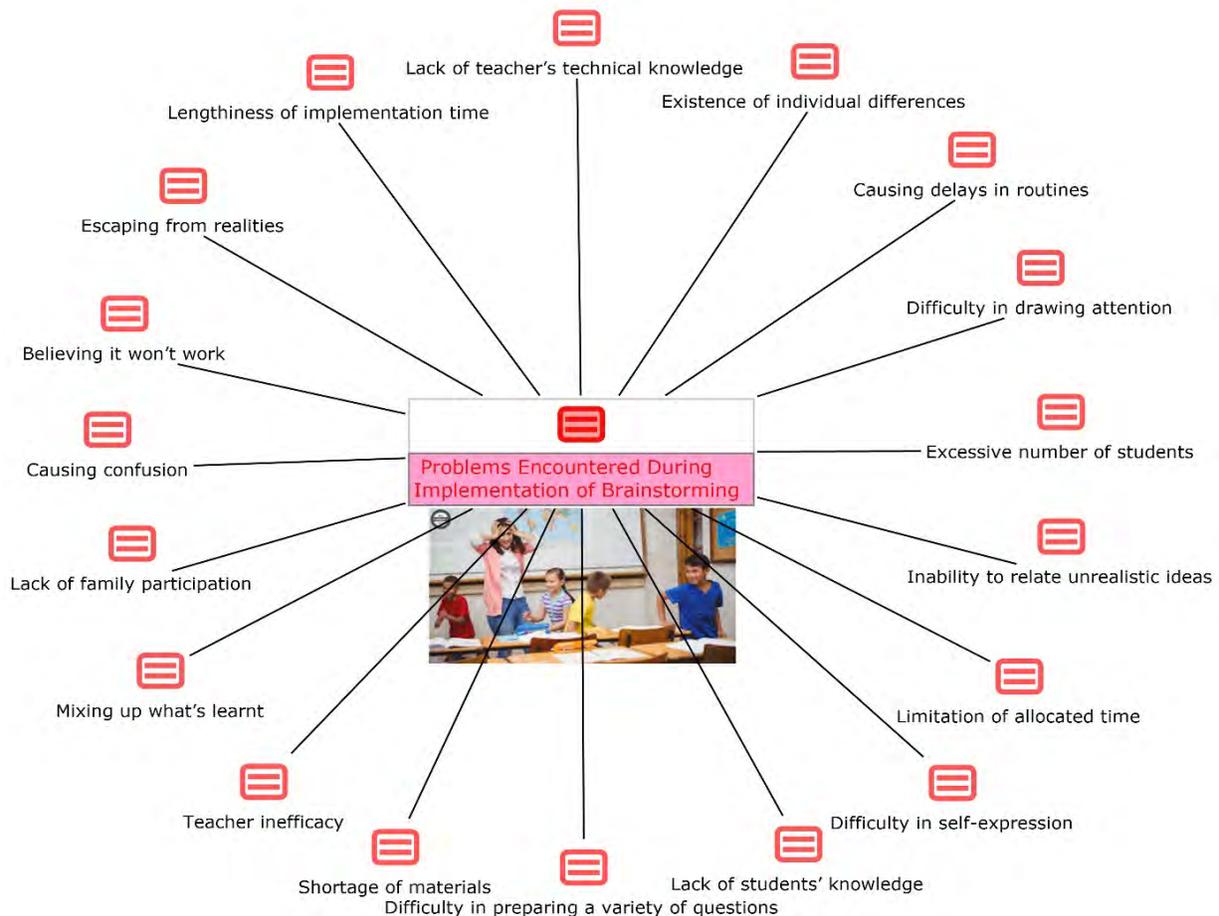

Figure 3: Problems encountered during implementation of brainstorming

Figure 3 congregates the problems which were reported to have been encountered during brainstorming activities. Some outstanding ones are, "Difficulty in drawing attention, shortage of materials, causing confusion, believing it won't work, lengthiness of implementation time, teacher inefficacy". Some statements taken as references while forming the codes are from Dm4- p. 41, coded study: "Generally we get into trouble when the child does not want to talk or respond, and withdraws into himself"; and from Kt1-s. 49, coded study: "One should know the stages very well while

preparing the questions to be asked during the activity, and there may not be questions from all stages in every activity"; and from the study coded Dm4-p. 41: "I feel inadequate. It seems as if I don't apply these techniques wholesomely…)". When the relevant codes are examined carefully, it is understood that the primary concerns are lack of time and materials, teacher and student inefficacy, and limitation of students' attention span. Accordingly, it can be suggested that some of these problems may be overcome with planning and preliminary preparation.

Discussion

The present study was designated as a qualitative attempt to revisit the brainstorming technique within an educational context by conducting a meta-thematic analysis of some research studies on its impacts on cognitive and affective domains of learning and problems experienced in practice. The impact of active learning on learning outcomes is well-established in the relevant literature (Prince, 2004). Thus, it is discernible that as an active learning technique, a well-planned and conducted brainstorming session ensures active student engagement while nourishing creative thinking at the same time. In this respect, the empirical evidence suggests that a brainstorming technique positively affects students' academic achievement, confidence, motivation and engagement, and concept learning (Goswami et al, 2017; Unin & Bearing, 2016; Tsai, 2013; Gül, 2013; Duru, 2009). Several codes related to the positive contributions of brainstorming to learners' cognitive and affective skills were formed within the present study. Creativity is thought to be stimulated or promoted with the use of this teaching strategy as it increases task focus, encourages but doesn't impose novelty in idea generation, and pursues a problem-finding and solving cycle within meaningful learning contexts.

Brainstorming is reported to provide a student-centred learning focus in which students are able to learn according to their individual capacity, which makes lessons attention-grabbing, fun and comprehensible. In this sense, attention is said to be a determinant factor in learning outcomes since it eases processing of information and instant response (Al Omairi & Al Balushi, 2015). Brainstorming could be suggested as a way of minimising some students' dominance in classrooms as it encourages wider class participation (Wiest & Pop, 2018) by allowing non-dominant students to become courageous and eager to talk freely while others show empathy and respect their ideas. It is further purported that brainstorming sessions promote critical thinking skills by encouraging students to break down prejudices and develop flexibility of thinking. A study by Villavicencio (2011) reveals in this regard that critical thinking is positively correlated with achievement, for engagement in critical thinking enables learners to utilise their cognitive resources properly for task accomplishment, rendering them less anxious, thus increasing achievement.

 Enabling improved thought and developing imagination are also reported to be contributions that use of brainstorming may make to the cognitive domain of learning. According to Vygotsky (2004), creative activity is closely associated with imagination, and thus creative imagination is the ability to compound already existing elements and present them in different ways. An increase in desire and determination to ponder over a presented problem case with the collaborative and cooperative power of group work or a brainstorming session is thought to vitalise the creative imagination. It is further thought that the rule proposed by Alex Osborn (1953), the mastermind of the brainstorming concept, about not criticising ideas while they are being generated prepares a convenient platform for unleashing imagination and good resulting ideas. This fact is reiterated by other researchers (Tsai, 2013) as, "the brainstorming technique attempts to give free reign to imagination for the sake of

evoking ideas and to encourage participants to express their thoughts without judgment". An outstanding code that was formed around the affective contributions of brainstorming interventions in an educational context is that it could create an activated positive mood, which is found to be associated with higher levels of creativity in a meta-analysis by Baas et al (2008).

The third theme of the present study revealed the problems which are faced while implementing the brainstorming technique in an activity. These problems may stand as barriers to effective brainstorming in the teaching-learning process. One point that is coded within the model demonstrating the problems theme is the existence of students who think that the brainstorming sessions will not work, and they cannot come up with original solutions to their learning tasks. This may result from fear of critical evaluation by other members of the brainstorming group (Putman & Paulus, 2009), among some other reasons, and thus could culminate in some individuals' giving up on the group and a decline in the productivity of idea generation (Isaksen & Gaulin, 2005; Napier & Gershenfeld, 2004). Another significant code that stands out as a problem militating against the functionality and productivity of a brainstorming group is teacher inefficacy. In the educational context, teachers play a critical role as designers and facilitators of brainstorming sessions. As brainstorming is a group activity, teachers can address the needs of groups, manage group interaction, collectively find out solutions to complicated problems and provide joint support for fulfilment of the generated ideas (Isaksen & Gaulin, 2005). Teacher inefficacy may generally make its presence felt as difficulty in drawing students' attention as it is purported by the participants of the relevant studies. The way a teacher poses a brainstorming prompt becomes more of an issue, since it is claimed to affect performance (Goldenberg & Wiley, 2019).

The fact that some students tend to be unable to relate ideas that are not realistic is also reported to be a barrier to implementation of a healthy idea generation session. Some students might mistakenly regard brainstorming as an activity in which they are supposed to create as many ideas as possible, thus, frequently coming up with sloppy, unmoulded ideas which go nowhere. In this regard, Rietzschel et al (2014) highlights the fact that while earlier research studies put forward the possible correlation of idea quantity with the number of good ideas produced, the quantity has been shown to be unrelated to the idea of quality. The quality comes forth at this point as a more effective characteristic of any brainstorming activity if creativity is desired to be ensured. It is emphasised that although some research suggests that individuals could create more quality ideas than groups, yet as individuals are exposed to others' ideas within a group, this can enhance both idea quality and quantity (Goldenberg & Wiley, 2019; McMahon et al, 2016; Stroebe et al, 2010). And when considered from their perspectives, students believe they can generate more ideas and, thus, they prefer interactive brainstorming in groups rather than individual brainstorming (Park-Gates, 2001). To assure the quality of ideas to be generated in a brainstorming activity, narrowing down the scope of the problem of an activity by clearly defining boundaries and identification of explicit creativity instructions are suggested as two efficient ways (Rietzschel et al, 2014).

The shortage of classroom materials conducive to learners' needs and interests was also reported to hinder the flow of a group brainstorming session and the resulting productivity of idea generation. Evidence from some studies in this regard suggests that supplying a variety of appropriate materials, devices and other resources could lead to an arousal in creativity (Davies et al, 2013). Moreover, limitation of time allocated for brainstorming activities due generally to obligation of alignment with

the curriculum is thought to be an obstacle to the proper conduct of brainstorming sessions. The research reveals that the fulfilment of creative outcomes in an activity is mostly possible through the flexible use of time and when learners are allowed to work at their own pace (Davies et al, 2013). Individual learner differences may seem to block the way to successful implementation of a brainstorming activity as well; however, increasing teacher awareness of students' various learning styles, strategies and multiple intelligences can turn this situation into an advantage for stimulating such skills as divergent, lateral and critical thinking to foster creativity.

Conclusion and Implications

The research on creativity in educational contexts reveals that everybody has creativity and that it is possible to teach and develop creativity (Hernandez-Torrano & Ibrayeva, 2020; Tsai, 2013). Thus, it falls to teachers to find and implement strategies conducive to unleashing students' potential for creativity within the classroom. Moreover, brainstorming may be considered as a process of searching, the target of which is innovative and useful ideas (Nickerson, 1999). Thus, it should be noted that innovative products and creations are sparked by ideas in the beginning. As a matter of fact, brainstorming is defined as, "the development of novel ideas that are useful" (Paulus, 2000). At this very point, the brainstorming technique provides suitable premises for creative learning, which, in turn, has an impact on academic achievement as well. In this case, the utilisation of this creativity teaching technique will furnish the learning environment, whether virtual or face-to-face, with an active learning component. As mentioned earlier, the first use of the brainstorming technique for idea generation appeared in the advertising sector; this gives us a justified reason to predict that the use of this creativity technique in learning environments could not only foster individual learning development but it could also promote learning for social and economic development in that, it is stated in the literature that creativity is a key to development and global competitiveness (Bobirca & Draghici, 2011; Sacchetti, Sacchetti & Sugden, 2009; Rausch, 2007). Therefore, it is believed that the deployment of brainstorming to stimulate creative thinking skills will contribute to learning for development.

As the learning experiences provided for students differ, the methods for learning them may vary, too. Instead of making use of one method or technique, it would be more appropriate to give place to a variety of techniques to improve thinking skills. Hence, a combined use of more than one method or technique could yield better results in terms of achievement rather than merely focusing on brainstorming. In this regard, some research on the use of brainstorming within newer teaching-learning approaches, like flipped classrooms and game-based classrooms, might prove better in terms of its effect on learning outcomes. Further research is also necessary in order to have a clear-cut framework for the efficiency of brainstorming in diverse educational contexts, as we mentioned earlier that there is negligence in this regard. Unlike the propensity of mistaking it for merely idea generation, which, in fact, is only one stage within the process (Park-Gates, 2001), brainstorming is a creativity stimulating technique that can include the use of diverse creative thinking skills. Thus, empirical studies experimenting on the use of different creative thinking skills such as divergent, convergent, lateral and critical thinking and problem-solving skills in various teaching contexts, can be suggested for future research.

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Appendix 1: Cohen Kappa Values of the Themes in the Study

Cognitive (Figure 1)				Affective (Figure 2)				Problems (Figure 3)			
K2				K2				K2			
	+	-	Σ		+	-	Σ		+	-	Σ
+	31	3	34	+	24	1	25	+	18	1	19
K1 -	2	25	27	K1 -	2	17	19	K1 -	0	8	8
Σ	33	28	61	Σ	26	18	44	Σ	18	9	27
Kappa: .835 p .000				Kappa: .860 p:.000				Kappa: .914 p:.000			