The Effects of Brain-Based Training on the Learning and Retention of Life Skills in Adolescents

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Abstract

Introduction: Brain-based teaching is the implementation of principles and strategies derived from an understanding of the brain to enhance learning. Authors in this research investigated the effects of brain-based training on learning and retention of life skills in adolescents.
Methods: This experimental study was designed as a pre- post-test with a control group model and was conducted at the Center for Intellectual Development of Children and Adolescents in Iran/Isfahan in the academic year of 2014-2015. Two groups were selected using random cluster sampling. During the research process, the experimental group received a brain-based training package (in 10 sessions) while the control group continued with their regular training.
Results: Multivariate analysis of covariance (MANCOVA) was used to compare the pre-test and post-test results. A significant difference was observed between the two groups of this study in learning ($F=22.906$, $P<0.01$) and retention ($F=34.744$, $P<0.01$).
Conclusion: The findings of this study imply that brain-based training had much more effect on students' learning and retention compared to traditional training.

Keywords: Brain-based Training, Neuroscience, Adolescents

Introduction

Educators worldwide are concerned with the development of learning and teaching strategies that improve learning outcomes (1). Scientific developments are transforming learning approaches (2) providing a ground for education and neuroscience to unite (3). Neuroscience studies have contributed to both understanding the structural and functional qualities of the brain as well as taking into consideration individual differences and learning styles, while preparing for contents, activities and environments (4). The emergence of cognitive neuroscience has shed a light on how knowledge is acquired, organized and maintained helping educators to better comprehend the vastness of brains, its potentials and organizational layers (1). As Jones puts it "The demand for neuroscience-informed education comes from both directions, with neuroscientists emphasizing the potential of their work to improve education and educators being keen to learn what neuroscience has to offer"(5).

Neuroscience as broadly defined, investigates the processes by which the brain learns and remembers, from the molecular and cellular levels right through to the brain systems (3).Brain-compatible learning is the understanding of teaching based on what we have learned directly from studying the brain and brain-compatible teaching is the implementation of principles and strategies that we know about the brain (6). Brain researchers are now more able than ever before to understand how the brain works, what affects the brain, and what implications these discoveries have for education.

Based upon these discoveries new methods of teaching have been devised using the term, brain-based strategies or brain targeted learning (7). Educators in every field are concerned with the development of learning and teaching strategies that support how knowledge is acquired, organized, and retained (1). Traditional teaching, has long been criticized for: not being developmentally and socio-culturally sensitive, passivity of learners, communication and transmission of knowledge by teachers, and learners are taught same material at the same point (8,9). Brain-Based Teaching Approach (BBTA) is one such teacher facilitated and learner centered approach that utilizes learner's cognitive endowments and can effectively reach all students' individual needs (10).

Each person's brain is able to detect patterns, memorize, self-correct, learn from experiences and create. Teachers should actively take advantage of these natural processes by designing and orchestrating lifelike and enriching experiences for learners, to ensure that students process experience in such a way as to increase the extraction of meaning (11). Brain-based education is resembled in three words: *engagement*, *strategies*, and *principles*. Such education is the engagement of strategies based on principles derived from neuroscientists (12). Education has come to benefit greatly from the findings of how the brain is constructed and how the brain learns, which has become vital information for all teachers today (13). Some of these revelations are: 1) The brain works more like a sieve than a sponge, because it is designed to let go of unimportant information, 2)enriched environments grow dendrites, 3) memory gets constructed and reconstructed throughout the brain 4)brains are as unique as fingerprints, 5)experiences shape brain's organization, 6) brains are plastic, 7) the brain is not that much like a computer; as the complexity of connections and problem solving quality that occurs in the human brain cannot be simulated , 8) analogy of a jungle ecosystem is inapt description of the human brain in appearance and growth of dendrites, 9) pruning is a process that occurs in teenage brains, 10) "added a wrinkle to my brain" means you just aged (14).Unlike traditional methods of schooling, which is often blamed to inhibit learning by ignoring the brain's natural learning processes, the Brain-Based Teaching Approach (BBTA) is based on the functional properties of the brain as related to learning, and is believed to enhance learning due to its holistic approach towards the learners(10). Based on these characteristics, and with the emphasis on the integration of optimal learning conditions, orchestrated immersion and active processing, this strategy is believed to be able to fulfill various learning requirements whilst fostering a higher motivation for learning and achievement in students. Hence, the BBTA is perceived to be a potential solution in dealing with motivational issues amongst students (15). In response to criticisms posed on brain-based learning, Hardeman asserts that, it is obvious that all learnings involve the brain, but not all teaching does. She further describes how regular teaching practices at schools defy the neuroscience information about the brain's natural learning mechanisms. Her Brain-Targeted Teaching Model comprises six stages with interrelated components (16).

Studies show that brain based learning has a significant influence on achievement, retention (17,18) attitude and learning process (2). Furthermore, the researcher in a meta-analytical study measured the effect sizes of the quantitative studies that examined the effectiveness of brain-based learning on students' academic achievement. Their findings indicated that 35 out of 42 comparisons had positive effect sizes (19). Although research has been prolific in the past two decades, but brain based related research has been least focused on adolescents' learning and life skills' training.

Adolescence is a period of great changes for young people. It is a time when physical, cognitive, social, emotional and interpersonal changes are happening at an accelerated rate. Neuroscience has made a tremendous contribution in shedding light on the changes occurring in teens' brains and why they behaved the way they do. As they grow and develop, young people are influenced by outside factors such as: parents, peers, community, culture, religion, school, media and the world events (20, 21).They need to be understood as complex individuals who bring diverse perspectives to the learning context. Adolescents learn better when they encounter learning that is appropriate to their developmental level, receive teaching that is differentiated, are allowed to share and discuss ideas and to work together on tasks, are afforded multiple strategies, and to integrate and interpret knowledge meaningfully, are provided opportunities to develop and use strategic thinking skills, are given guidance and feedback about their work and are in a safe, supportive environment where personal ideas are valued and where negative emotions, such as fear of punishment and embarrassment, are minimized (22). Adolescents mostly benefit from teaching methods which helps them learn better and enjoy more in the process of leaning. Furthermore, adolescents need some necessary skills for coping with their internal and external changes. These skills are known as life skills.

Life skills are abilities for adaptive and positive behavior that enable individuals to deal effectively with the demands and challenges of everyday life. These abilities are: awareness, self-management, empathy, effective communication, stress management, emotion management, problem solving, decision making, critical thinking and creative thinking (23). In this study adolescents were provided for learning of life skills with a brain-compatible educational environment. These adolescents were members of the Center for Intellectual Development of Children and Adolescents (CIDCA) which is affiliated to the Education Organization of Iran that provides complementary educational services such as: painting, storytelling, handicrafts, role playing, reading, writing and life skills. At the present, more than 850 centers provide cultural and artistic activities for children and adolescents countrywide.

As neuroscience has made a tremendous contribution in shedding light on the changes occurring in teens' brains and why they behaved the way they do, hence, the

question posed in this research was: Does brain-based approach, foster a higher motivation for learning and achievement of necessary life skills in adolescents, for coping with their internal and external changes?

Methods

This study was a quasi-experimental research (pre- and post-test with a control group model) that was conducted to determine the effects of the brain-based training on learning and retention of adolescent's life skills. Participants in both groups were tested 3 times, before and after the procedure and with a time lapse of one month.

Subjects were selected from a group of adolescents who were the members of the CIDCA (Center for Intellectual Development of Children and Adolescents) in Iran/Isfahan. Participants were girls, within the age range of 13 to 15 years. Due to a large extensive statistical population and difficulty of access to the list of members at each center, two groups (experimental and control) were selected through random cluster sampling. At first, from all the institutes in Isfahan, two centers were randomly selected and from each center, ten members were selected and assigned to experimental and control groups. It is noteworthy that for more effective interaction with the staff and participants in conducting the sessions, subject entry criteria included: 1) girls aged 13 to 15 years, 2) membership in the CIDCA, 3) the presence of three days a week in center, 4) a termination agreement for the participants along with a moral commitment on their part to avoid irregularities and absenteeism. Furthermore for ethical considerations, all participants of the research were well informed about the aims of the study and the training sessions were scheduled with their convenient time.

In order to examine the participants' learning and retention of life skills, a researcher-made life skill test was developed. This test was comprised of 20 multiple choices questions and was prepared on the basis of the content of Life Skills program for adolescents at the center (CIDCA press). This test was at first validated by some expert instructors and as a result some questions were modified or replaced with other questions. Then the validated draft was administered to 50 adolescents for assessing its reliability, which was calculated to be (r=0/84).

This study was carried out in 10 sessions (60 minutes each). Each session, was planned to address one of the life skills. The skills included: self-management, empathy, effective communication, awareness, stress management, emotion management, problem solving, decision making, critical thinking and creative thinking.

The instructional design was based on the principles of brain-based teaching (12, 21, 24). These principles were: brain activation, newness, challenge, meaning making, enrichment, interactive feedback, group collaborations for memory improvement and retention.

- For brain activation, at the beginning of each session, some explanations were given about the importance of the intended topics and their necessity for having a healthy life.
- For creating newness, power point, short stories and role playing were used.
- For creating challenge and meaning, participants were asked to express their experiences and create a link between the topic of discussion in class and their daily lives.
- For enrichment and interactive feedback, problem solving tasks were used (in a problem solving task different solutions to a problem are provided through group dialogues, discussions and feedback).
- For group collaborations, at the end of each session, participants were divided into two groups of two or three to discuss and review discussion topics. In each session, members were reshuffled, and new ones were substituted in each group.

Participants in the control group received life skills training with the pre-planned traditional teaching methods in 10 sessions by the center. The educational content of the control group was the same of that in the experimental group; but by a different training method. A so called indirect instructional method was used at the center. In each session, participants were either asked to read a book or watch a game, and then recognize the targeted skill. In fact, in this method, the sub-skill was presented through the content. Then the participants talked about the clues which they used to identify the skill in a group discussion. In order to determine the influence of both the teaching methods on participants' life skills, the researcher-developed life skill test was administered 3 times: as a pre-test before sessions began, as a post-test at the end of the 10 sessions, and as a retention test, a month after the last session.

Results

To examine the effects of brain-based teaching on adolescents' life skills, besides the descriptive statistics, a multivariate analysis of covariance (MANCOVA) was also used.

As displayed in Table 1, the mean score for the experimental group was 12.80, was 6.60 for the control group and was 12/50 and 5/40 for the learning test and the retention test, respectively. The mean scores, shows that the experimental group outperformed the control group on both learning and retention tests. In addition, a multivariate test was run to find out whether a statistically significant difference existed between the two groups. The results are presented in Tables 1, 2, 3.

The Levene's Test was used to examine the equality of the variances between the groups. Based on the results, the groups under study had homogenous variances in both variables; learning (F=1/06, P>0.05) and retention (F=2/61, P>0.05).

As displayed in Table 2, the results of the Wilkes Lambda test shows that the experimental action had a significant effect (F=16.52, P<0.01).

Data analysis in Table 3, shows that the brain- based teaching had a significant effect on life skill learning (F= 22.906, P<0.01) and retention (F=34.744, P<0.01) of the experimental group. In fact, by controlling the pretest scores, brain- based training increased learning (57/4%)

and retention (67%).

Table 1. Descriptive Statistics

Group	Test	N	Learning		Retention	
			Mean	Std. Deviation	Mean	Std. Deviation
Experimental	Pre-test	10	6/30	3/36	6/30	3/36
	Post-test	10	12/80	3/35	12/50	3/06
Control	Pre-test	10	6/50	3/56	6/50	3/56
	Post-test	10	6/60	2/95	5/40	2/87

Table 2. Multivariate Test

Effects		Value	F	Hypothesis df	Error df	p' value	Partial Eta Squared
Group	Wilks' Lambda	.32	16.52	2	16	.00	.67

Table 3. Test of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	p' value	Partial Eta Squared
Group	learning	196.950	1	196.950	22.906	.00	.574
	retention	257.382	1	257.382	34.744	.00	.671

Discussion

In this study, the effects of brain based teaching on adolescents' learning and retention of life skills were examined. The motivation behind conducting such research originated from the review of the studies from the field of educational neuropsychology. Benton, believes that educational psychologists would need an understanding of brain research methods and principles, because of the tremendous expansions in the field of neurosciences (25). Neurocognitive research has focused on detecting the underlying neural processes involved in academic learning, providing valuable insights for educators. In few decades, the findings are substantiated with more replications across different tasks and individuals. Further support comes from the examples of research using brain-imaging technology to address important academic research questions. Findings of this study revealed that, the brain-based teaching appears to be more effective than the traditional teaching method in the learning and retention of life skills. Based on the theoretical observations and the latest research discoveries in the field of human brain, these strategies are designed in such a way so that they will be compatible to the structure, tendency and optimum functioning of the brain, to ensure the effectiveness of a student's learning process. Although all teaching processes are essentially brain based, compared to other methods, the brain based teaching is a strategy specifically created to value the true potential of the brain in a learning process. According to brain-based education, learning is strengthened with emotional involvement, challenging learning tasks, orchestrated immersion, complex and active experiences, enriched environments, and active processing (26). In brain based comprehensive approaches, learners are encouraged to explore different avenues of taught and to deepen their understanding of the topic, fostering a higher interest for the subject and tasks in hand (15). This finding is in line with the results of studies like (2,17,18); and with the result of meta-analytical studies (19).

Regarding these findings, the following implications and suggestions is worth considering:

• The etiology of learning is a complex science; hence there is a need to capitalize on the potentials of neurosciences and its contribution to educational research. Knowing the way students' brains work can help to design appropriate educational methods, materials and even educational environments.

• There is a need to strengthen the links between neuroscience and basic research in education.

Like any other study, there are some limitation to this research. It can be mentioned that the study sample was only limited to girl adolescents of CIDCA; longer and more flexible time schedules would have been more beneficial for the intervention program, which was limited due to coordination problems with the center.

Conclusion

As a new paradigm of teaching, brain based holistic approach utilizes information about the human brain that helps learners to deepen their understandings of the content, resulting in a long lasting and more effective learning. As it has been indicated in this research, brain based teaching, has more positive effects on learning and retention, than customary teaching, suggesting that brain-compatible approaches are more effective in dealing with educational issues.

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References

1. Cardoza MP. Neuroscience and Simulation: An Evolving Theory of Brain-Based Education. Clinical Simulation in Nursing. 2011; 7: 205-208.
2. Tufekci S, Demirel M. The effect of brain based learning on achievement, retention, attitude and learning process. Procedia Social and Behavioral Sciences. 2009; 1: 1782–1791.
3. Goswami U. Neuroscience and education. British Journal of Educational Psychology, 2004; 74: 1–14.
4. Gulpinar MA. The principles of brain-based learning and constructivist models in education. Educational Sciences: Theory and Practice, 2005; 2: 299-307.
5. Jones PH. Neuroscience and Education: A Review of Educational Interventions and Approaches Informed by Neuroscience. University of Bristol: 2014.
6. Jensen E. Introduction to brain compatible learning. second edition. SAGE publication: 2007.

7. Roekel BV. Brain-based Learning: Implications for the Elementary Classroom. Master of Education Program Theses. Dordt College: 2002.
8. Santrock JW.Educational Psychology. 4th ed. New York. McGraw – Hill:2009.
9. Eggen P,Kauchak D. Educational Psychology, Windows on classrooms. Pearson Intl ed: 2012.
10. Thomas MT, Swamy SS. Brain Based Teaching Approach – A New Paradigm of Teaching. International Journal of Education and Psychological Research. 2014; 3(2): 62-65
11. Caine RN, Caine G.Making connections: Teaching and the human brain, Alexandria, VA: Association for Supervision and Curriculum Development: 1991.
12. Jensen E. Brain based learning, the new paradigm of teaching. second edition. SAGE publication: 2008.
13. Williams RB, Dunn SE. Brain-Compatible Learning for the Block. second edition. SAGE Publication: 2008.
14. Fogarty R. Brain- compatible classroom. third edition. SAGE Publication: 2009.
15. Saleh S. The Effectiveness of the Brain-Based Teaching Approach in Generating Students' Learning Motivation Towards the Subject of Physics: A Qualitative Approach. US-China Education Review. 2011; 1:63-72.
16. Hardiman M. Informing pedagogy through the Brain-Targeted Teaching Model. Journal of Microbiology & Biology Education. 2012; 13(1): 11-16.
17. Ozden M, Gultekin M. The Effects of Brain-Based Learning on Academic Achievement and Retention of Knowledge in Science Course. Electronic Journal of Science Education. 2008; 12 (1): 1-17.
18. Haghighi M. The effect of brain- based learning on Iranian EFL learner's achievement and retention. Procedia - Social and Behavioral Sciences. 2013; 70: 508 – 516.
19. Gozuyesil E, Dikici A. The Effect of Brain Based Learning on Academic Achievement: A Meta-analytical Study. Educational Sciences: Theory & Practice, 2014; 14(2): 642-648.
20. Spano S. Stages of Adolescent Development. A collaboration of Cornell University. University of Rochester and the New York State Center for School Safety: 2004
21. Wolfe P. Brain Matters: Translating Research into Classroom Practice. Second Edition. ASCD publication: 2010.
22. Crawford GB. Brain-Based Teaching With Adolescent Learning in Mind. second edition. SAGE Publication: 2007.
23. Dawson P, Guare R. Executive Skills in Children and Adolescents. Second Edition. Guilford Publication; 2010.
24. Klein SB. Learning: Principles and Applications. Seventh Edition. SAGE Publication: 2015.
25. Benton SL. Introduction to special issue: Brain research, learning, and motivation. Contemporary Educational Psychology. 2010; 35:108–109.
26. Caine R, Caine, G, McClintic C, Klimek K. 12 Brain/Mind learning principles in action. Thousand Oaks, California: Corwin Press; 2005.