Mental Arithmetic Education by Abacus and the Development of Childrens' Inteligence

珠心算教育与少儿智力开发

全国珠心算教育对比实验测试优秀成果选编

中国珠算心算协会秘书处 编

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Economic Science Press

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图书在版编目（CIP）数据

珠心算教育与少儿智力开发／中国珠算心算协会秘书处编．—北京：经济科学出版社，2006.8
ISBN 7-5058-5721-5

Ⅰ.珠… Ⅱ.中… Ⅲ.①珠算-儿童教育-研究 ②心算法-儿童教育-研究 Ⅳ.0121

中国版本图书馆CIP数据核字（2006）第081867号

责任编辑：高进水　于庆昭
责任校对：桂裕生
版式设计：代小卫
技术编辑：金　印

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——全国珠心算教育对比实验测试优秀成果选编
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经济科学出版社出版、发行　新华书店经销
社址：北京海淀区阜成路甲28号　邮编：100036
总编室电话：88191217　发行部电话：88191540
网址：www.esp.com.cn
电子邮件：esp@esp.com.cn
天宇星印刷厂印刷
永明装订厂装订
787×1092　16开　18印张　286000字
2006年8月第一版　2006年8月第一次印刷
印数：0001—3100册
ISBN 7-5058-5721-5/F·4980　定价：28.00元

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前　言

珠算是我国古代重大发明之一。由于它有多元功能，因而久盛不衰，对我国的经济、文化和科学技术发展作出了重大贡献。随着珠算应用实践的发展，显示出三种重要功能。一是计算功能。利用珠算可以求解各种应用数学问题。美籍华裔物理学家、诺贝尔奖获得者李政道博士曾称赞道："我们中国的祖先，很早就创造了最好的计算机，就是到现在还使用的算盘。"二是教育功能。20世纪50年代江西省宜春市某小学和上海市崇明区某小学，将小学低年级数学口算、笔算与珠算结合进行教学实验，结果非常成功，并在全国迅速传播，最盛时期有上千万的学生在这种教学中学习。此教学法概括为"三算结合教学法"，且有许多优点：（1）以珠示数，将抽象数变为形象数；（2）拨珠运算与得数同时完成，非常便捷；（3）数位清楚。由于这些长处，数学教学易被儿童理解，能大大提高教学效率。如吉林省吉林市江密峰中心小学的对比实验显示，国家教学大纲规定的449课时才能完成的小学1~3年级数学教学内容，用"三算结合教学"，只需332课时即能完成教学任务。虽然实行统编教材后"三算结合教学"受到了冲击，但还有不少学校坚持"三算结合教学"。三是开发儿童智力

潜能的功能。20世纪70年代末期，在珠算教育和“三算结合教学”基础上发展起来的珠心算教育，表现出有开发儿童智力潜能的显著作用。一些富有探索和创新精神的小学数学教师和珠算教育工作者，对珠心算教育效果进行了大量的对比实验测试研究工作，取得了丰硕成果。目前已经可以用对比实验测试的一系列数据，说明珠心算教育对开发儿童智力潜能的影响程度。

为了将各单位的对比实验测试研究成果搜集起来，深化学术研究，加深和提高对珠心算教育开发儿童智力潜能作用的认识，促进珠心算教育事业的发展，中国珠算心算协会（以下简称中珠协）决定在全国开展一次珠心算教育对比实验测试研究优秀成果评选活动。中珠协将各地区珠协推荐的333篇论文，组织珠心算教育界专家进行严格的评选，共评选出优秀论文34篇。其中特等奖1篇，一等奖10篇，二等奖11篇，三等奖12篇。这次入选的论文，只限于珠心算教育对比实验测试研究的优秀论文，重内容，不重文字，目的是通过科学实验求证珠心算教育对开发儿童智力潜能是否有客观实在的作用。有关教学理论和教学方法方面的优秀论文均未入选，请推荐单位和作者谅解。

这次优秀论文评选活动十分成功，展示了珠心算教学具有开发儿童智力潜能作用的客观性。入选的34篇论文有三个显著特点：（1）对比实验测试的样本量大，科学价值高。如内蒙古教育学会课程教材专业委员会（以下简称内蒙古教育学会）组织进行的《珠算—计算—大脑珠、口算为特色的小学数学课改追踪调查研究报告》，参加对比实验测试的学生，实验班、对照班各1500多人。样本量大，可以淡化个别特殊情况的干扰，能比较充分体现客观真实性，富有科学价值，可信度强。（2）对比实验测试项目多，测试数据翔实，能从多方面反映珠心算教育对开发儿童智力潜能的影响程度。（3）不同的实验测试单位，

虽同一实验测试项目，测试方法可能有不同，测试数据有差别，但数据显示的指向是相同的，证实了开发智力潜能的客观规律性。

丰富翔实的对比实验测试数据，充分表现出珠心算教育对开发儿童智力潜能的显著作用，主要表现在以下八个方面。

1. 记忆力提高。记忆力是智力的最重要因素。没有记忆力，就不存在智力。学习就是记忆、理解知识和掌握运用记忆的知识。提高记忆能力，就可以提高学习与工作效率。在34篇论文中，有13篇论文涉及记忆能力测试，实验班学生的记忆能力比对照班的要高2~4成，个别单位也有低于或高于这个幅度的。

2. 思维能力强。在34篇论文中有17篇论文涉及思维能力测试，实验班学生的思维能力均显著或非常显著好于对照班。

3. 独创性好。如内蒙古教育学会测试了思维品质独创性，测试内容包括形象编题、数字编题、模仿编题、半独立编题等几项内容，1年级的实验班和对照班基本无明显差别；2~5年级的实验班的思维独创性明显好于对照班，有的测试项目则非常显著好于对照班。

4. 阅读速度快。如新疆石河子市第一小学测试阅读速度，实验班学生一秒钟阅读13.93个汉字，对照班仅阅读7.85个汉字，实验班比对照班快77.4%。由于阅读速度快，实验班比对照班理解率低1.1个百分点。即使考虑这个因素，实验班的阅读效率仍比对照班高70%以上。

5. 智商提高。34篇对比实验测试论文中，6篇论文涉及测试智商变化情况，实验班学生的智商增加值或智商值均显著高于对照班。

6. 各科学习成绩好。由于以上各项认知能力的提升，提高了学习效率，实验班学生各科学习成绩均显著好于对照班。

7. 珠心算教育开发儿童智力潜能的作用，不仅对普通儿童教育效果好，对智障儿童教育效果也显著。如上海董李凤美康健学校的实验研究成果就很有科学价值。

8. 学习珠心算提升的脑力可以长期保持，发展有后劲。不少单位对学习珠心算学生的后期发展进行了跟踪调查。从两个群体后期发展看，学过珠心算的学生显著好于未学习珠心算的学生。如内蒙古宁城县五间房小学前五届（1992～1996年）珠心算教育实验班，第一届学生高中升学率为78.3%，全县为12.5%；大学升学率为43.3%，全县为10.1%。第二届学生高中升学率为87.1%，全县为14.2%。大学升学率为43.5%，全县为14.1%。第三届学生高中升学率为66.7%，全县为17.5%；大学升学率为31.2%，全县为22.6%。第四届学生高中升学率为68.6%，全县为16.4%。第五届高中升学率为77.8%，全县为17.8%。

以上对比实验测试成果显示，珠心算教育对开发儿童智力潜能有显著作用，在国内受到一些著名专家的高度评价。全国著名差异心理学专家、上海师范大学洪德厚教授，对新疆石河子市第一小学的对比实验测试研究成果的评价是："本研究在某些方面，对某些传统理论和观点有所突破，例如，在记忆心理学中，一般认为，短时记忆广度，在某一年龄段内，是很难会有通过教学而有很大提高的，但研究结果却显示，十一二岁的儿童，通过一个时期的珠心算学习，却有显著提高，大大扩充了短时记忆接受信息的容量，这是一个可喜的理论收获。"以时任国务院学位委员会学科组成员、北师大博士生导师林崇德教授为主任，著名教育家、教育部小学教材编审组组长霍懋征同志为副主任的11位专家评审委员会，对内蒙古教育学会对比实验研究成果（原课题名称为"发展小学数学实验研究"）的评审鉴

定认为：是“素质教育的成功范例”，“科学性强”，“创新性强”，“有推广价值”，“它是一项挽救我国珠算教学的重要尝试。它充分挖掘算盘的教育功能，在全国率先将珠心算引进第一课堂”，“采用自然实验方法，在没有打破教学常规，没有进行强化训练加班加点的情况下，通过教材改革，减轻了学生过重的课业负担，是难能可贵的”。此项实验研究成果，在国际上也受到重视和高度评价。联合国儿童基金会1997年派专家组到赤峰市考察，认为此项研究是“初等教育成功改革项目”，并出资拍摄了以“人体潜能开发的突破”为题的专题片。美国科学教育协会的两位学者1997年到赤峰专门考察这项实验研究情况，认为了不起。考察后，美国科学教育协会连年向进行此项实验研究的学校捐款，截至2005年累计捐款310万元。珠心算教育还受到时任马来西亚政府总理马哈蒂尔的高度重视，他派人到中国考察，然后邀请中国珠心算教师徐思众先生任该国教育部珠心算教育顾问，给他配备专门的班子研究在马来西亚开展珠心算教育问题。经过六七年的研究和编写教材、培训教师的准备工作，经教育部、内阁和议会通过，决定从2005年开始将珠心算纳入全国小学一二年级教育计划内进行教学。

34篇实验研究论文内容非常丰富，样本量大，测试数据翔实。但也有不足之处，一是各单位的对比实验测试项目，是根据本单位的实验需要确定的，各有侧重，不是各单位实验测试所有的项目，因此，在对不同单位实验测试研究成果进行对比研究时出现困难。二是珠心算教育是新事物，有不同的学派，教学方法和教学重点各有不同，教学效果也有差别。为了进一步求证和检验珠心算教育对开发儿童智力潜能的功效和较好的教学方法，需要进行深入的研究探索。2004年11月报请教育部和财政部同意，在全国选择30个珠心算教育比较有基础的小学

和幼儿园进行“三年对比实验和十年跟踪调查”研究。教育部的领导同志指示，实验研究要选择有研究能力的研究所和大学。遵照教育部领导的指示，采用邀请招标的方式，同教育部中央教育科学研究所（简称中央教科所）合作，进行“认知行为学”方面的对比实验测试研究；由两所全国著名大学（浙江大学和中国科技大学）脑实验室组成的联合实验组，中科院院士唐孝威同志主持，进行珠心算教育开发儿童智力潜能作用的“脑机制”实验研究。两项实验研究均从2004年秋季开学时开始进行，将于2008年完成实验研究结题报告。

34篇优秀论文凝聚了珠心算教育工作者和测试人员的智慧与心血，并充分展示了珠心算教育开发儿童智力潜能的功能。中珠协将其汇编成册，热诚推荐给所有关注珠心算教育的读者。

首先，推荐给教育行政工作者和专家。通过论文集，可以了解珠心算教育的实际情况，给予积极的关注和支持。对珠心算教育有疑虑的专家学者，通过这本论文集了解珠心算教育的真实情况后，可以消除或减少某些误解。珠心算教育，不是为了培养训练少数心算尖子选手，而是为了开发儿童智力潜能，使儿童更聪明。学习珠心算，不但不会增加儿童的学习负担，影响儿童的全面发展，正相反，由于开发了智力潜能，增强了脑力，显著提高了教学和学习效果，相应减轻了学习负担，促进了素质教育的发展。任何新生事物，都是在不同观点的交流和不同意见参与下发展起来的。由于工作岗位和观察问题的视角不同，以及对珠心算教育实践情况了解的深度不同，有不同意见是正常的。尽管所处的工作岗位不同，但大目标是一致的，都是为了发展教育，为了中华民族的未来，在竞争的世界民族之林中处于有利的地位。批评质疑，也是参与新事物实践的一种方式，也是贡献的一种方式。

其次，推荐给珠心算教育和“三算结合教学”的教师。论文集所展示的研究成果，有利于珠心算教育和“三算结合教学”的教师全面了解珠心算教育开发儿童智力潜能对比实验测试情况，掌握各种对比实验测试数据，可以有效地解答学生家长提出的有关珠心算教育开发儿童智力潜能的各种问题。论文集中的一些教学理论和教学方法，对提高教学业务水平也是有很大帮助的。

其三，推荐给关心子女教育成长的家长。阅读论文集，可以使家长较详细地了解珠心算教育对开发儿童智力潜能的独特作用。通过学习珠心算，既能增强脑力，提高学习效果，又可以相对减轻学习负担。珠心算是值得选择的学习项目。

为了使本书早日同广大关注珠心算教育的读者见面，在实验研究论文的评选收录、排序和编辑中难免出现差错，敬请作者和读者指教，提出宝贵意见。本次对比实验测试研究论文征集和评选活动得到各地珠协、教学单位、教育科研单位和珠算专家学者的大力支持与合作，一并表示衷心的感谢。

编者

二〇〇六年六月

Preface

Abacus is one of the greatest inventions in our ancient times. It enjoys tremendous popularity for a long time with character of multi – function and has made great contribution to the development of economy, culture and scientific technology of our country. Three important functions emerged along with the application development of abacus. The first one is the function of calculation. Abacus can be used to solve all kinds of applied mathematics problems. As Mr. Tsung-Dau Lee, America citizen of Chinese origin, Ph. D. , Nobel Laureate in Physics put it, "Our Chinese ancestor had invented abacus, the best computer which is now being used. " The second one is education function. In the 1950's, teaching experiments on combination of mental arithmetic, written arithmetic and abacus arithmetic was conducted in low grades of two primary schools separately in Yichun city of Jiangxi Province and Chong Ming District of Shanghai. The experiments proved to be extremely successful and its experience was quickly wide spread throughout the country. At its peak time, there were more than 10 millions of students taught by this teaching method. This method is called as 3-arithmetic mathematics teaching method. It possesses several advantages. The first one is using beads to express number, changing abstract number into visual number. The second one is when we finish calculation by moving beads; the answer is simultaneously come out on the abacus. The third one is the digit place is expressed clearly. All the above advantages can help children easily grasp the knowledge of math so as to increases the efficiency of teaching. The contrast experiment on Jiang Mifeng Central Primary School of Jilin city in Jiling Province shows that the math-teaching task from

grade 1 to 3 of primary school can be finished within 449 class hours in accordance with the national teaching guideline. But if we take the 3-arithmetic mathematics teaching method, all teaching tasks can be finished within no less than 332 class hours. Although 3-arithmetic mathematics teaching has been greatly influenced by nationwide integration of teaching materials, there are still many schools continually taking this method. Third one is the function of tapping children's potential intelligence. In the late of 1970's, the mental arithmetic education stemming from the education of abacus arithmetic and 3 – arithmetic mathematics teaching showed its outstanding function of tapping children's potential intelligence. Some primary school mathematic teachers and abacus educators made exploration by doing a great deal of contrast trials research and had gained great achievements. At the moment, we can use a set of data coming from contrast trials to explain the influential degree of mental arithmetic education in tapping children's potential intelligence.

Chinese Abacus and Mental Arithmetic Association (CAMAA) decide to launch nationwide appraisal activity for excellent papers of contrast trial on mental arithmetic education. The purpose is to collect the best study achievements, to strengthen academic research, to deepen understanding on mental arithmetic education with the function of tapping children's potential intelligence and to improve the development of mental arithmetic education at last. There are 333 papers in total coming from regional abacus association. After strictly and earnestly evaluation made by experts of mental arithmetic education, 34 papers are chosen as the excellent paper, of which 1 for Special Prize, 10 for the First Prize, 11 for the Second Prize and 12 for the Third Prize. Since the purpose of appraisal is to trying prove the mental arithmetic education have the objective function of tapping children's potential intelligence through scientific experiment, the paper with good content on contrast trial of mental arithmetic education is selected in this book. We place high value on content but not the literacy writing of these papers. The excellent papers on teaching theory and teaching method are not collected in this time. We are willing to have the understanding from relevant recommendation units and authors.

The appraisal activity on excellent papers proves to be very successful. There are three characteristics existing in these 34 papers: Firstly, we take

plentiful samples for contrast trial so that the final data is of high scientific value. For example, Curriculum Materials Committee of the Education Association of Inner Mongolia (EAIM) conducted a trial study on primary school mathematics teaching reform characterized by mental arithmetic. More than 3000 students (1500 students for experiment class and contrast class respectively) participated in this contrast trial. A large number of samples can guarantee that the trial data is real, trustable and objective with high scientific value. Secondly, the abundant contrast trial items and accurate data will show the influential degree of tapping children's potential intelligence by mental arithmetic education. Thirdly, the different test unit with different test item and method lead to the disparity of data. Generally speaking, all data can basically reveal the objective law for tapping potential intelligence.

It can be illustrated in the following 8 aspects that mental arithmetic education plays an important role in tapping children's potential intelligence based on the final data of trial.

Ⅰ. Strengthening the memory ability. Memory ability is the most important factor of intelligence of human beings. No memory ability, no intelligence. Study is a course of memory, understanding and applying. Improving memory ability is conducive to study and work efficiency. Of 34 papers, there are 13 papers on test for memory ability. The memory ability of students in experiment class is twofold to fourfold higher than students in contrast class. But few of units concluded different data.

Ⅱ. Strengthening ideation. There are 17 papers on ideation trial. The data reflect that the students in experiment class with strong ideation, but the students in contrast class are not.

Ⅲ. Raising creative ability. For example, the EAIM set up five items for trial including drawing out question by visual way, drawing out question by number, drawing out question by imitating method and drawing out question by students almost themselves. The result is that there is no obvious distinction between experiment class and contrast class in grade one. But from grade 2 to 5, the creativity of students in experiment class is better than the students in contrast class. Some trial items' index shows that the experiment class is quite better than contrast class.

Ⅳ. Reading rapidity. The trial data on reading speed from First Primary School of Shihezi City of Sinkiang Autonomous Region shows that the student in experiment class can read 13.93 words per second, 77.4% faster than the student of contrast class, because they only can read 7.85 words per second. Reading rapidity influences students' understanding ability. From this point of view, the experiment class is 1.1% lower than contrast class. Nevertheless, the experiment class is 70% higher than contrast class in reading and understanding.

Ⅴ. Enhancing intelligence quotient. Among 34 papers, there are 6 papers paying attention to intelligence quotient's change. The value – added IQ and the IQ for students in experiment class is obviously higher than the students in contrast class.

Ⅵ. Promoting the study in various subjects. Owing to the improvement of the above cognitive ability, the study efficiency is enhanced. The students in experiment class achieve good score in all subjects they have taken compared with the students in the contrast class.

Ⅶ. The mental arithmetic education plays a good role not only on education of general children but also on retarded children. The research made by Dong – li Fengmei Kangjian School of Shanghai is of high scientific value.

Ⅷ. The brainpower of students will be kept in the sound condition for a long time after studying mental arithmetic. It will benefit the development of students in the future. Many units make trail investigation on the students after they have learned mental arithmetic. The result shows that the students with knowledge of mental arithmetic achieve good marks than those without knowledge of mental arithmetic. For example, The Wujianfang Primary School of Nicheng City of Inner Mongolia conducts experiment of mental arithmetic education from the year of 1992 to 1996. The graduation circumstance of Wujianfang Primary School is: The proportion of students entering senior high school in 1992 is 78.3% while the whole county proportion is 12.5%. The enrollment quota for entering college is 43.3% while the whole county quota is 10.1%. In 1993, the proportion of students entering senior high school is 87.1% while the whole county is 14.2%. The enrollment quota for entering college is 43.5% while the whole county is 14.1%. In 1994, the proportion of students entering

senior high school is 66.7% while the whole county is 17.5%. The enrollment quota for entering college is 31.2% while the whole county is 22.6%. In 1995, the proportion of students entering senior high school is 68.6% while the whole county is 16.4%. In 1996, the proportion of students entering senior high school is 77.8% while the whole county is 17.8%.

The above experiment data indicates that the mental arithmetic education has remarkable function of tapping children's potential intelligence. Many domestic famous experts spoke highly of the function of mental arithmetic education in tapping children's intelligence. Mr. Hong Dehou, Professor of Shanghai Normal University, and a famous expert of difference psychology praised the contrast trial research made by the First Primary School of Shi Hezi City. He said, "In some aspects, this trial research broke out of the traditional theory and idea. For example, in memory psychology, the extent of instant memory is hardly expanded in the part of age. But for the students with knowledge of mental arithmetic in age of 11 or 12 is different. The research shows that the student's instant memory capacity for absorbing information is developed obviously. This is a good harvest for theory." The Expert Evaluation Committee attended by 11 experts was set up for evaluating the trial research made by Education Institution of Inner Mongolia (the original project name is: the experiment research on development of teaching mathematic in primary school). The committee director is Prof. Lin Chongde, tutor for PH. D. Candidate of Beijing Normal University and member of Subject Department of Academic Degree Committee of the State Council of the People's Republic of China. Deputy Director is Mr. Huo Maozheng, the Head of Editing Group for Teaching Materials of Primary School of Ministry of Education, and a famous educator. The committee confirms that the mental arithmetic education with character of science and innovation is very successful in terms of education for all - round development. Its experience is worth popularizing. It can be treated as an important attempt for retrieving our abacus teaching, because it greatly develops the education function of abacus. They are the first one to introduce the mental arithmetic into the school class. It's commendable that the mental arithmetic teaching is carried on without breaking out of regular teaching plan and without adding any intensive training. To handle the problem of over weight of homework for students, the innovation on teaching materials