

**PEDAGOGICS  
APPLIED TO  
ARITHMETIC**

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Pedagogs Applied to Arithmetic by Carlton M. Ritter

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**CARLTON M. RITTER**

**PEDAGOGICS  
APPLIED TO  
ARITHMETIC**



# PEDAGOGICS

—APPLIED TO—

# ARITHMETIC.

—BY—

CARLTON M. RITTER,

PROFESSOR OF MATHEMATICS IN THE STATE NORMAL SCHOOL, CHICO, CAL.

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“HE THEREFORE THAT IS ABOUT CHILDREN SHOULD WELL STUDY THEIR NATURES AND APTITUDES, AND SEE BY OFTEN TRIALS WHAT TURN THEY EASILY TAKE, AND WHAT BECOMES THEM; OBSERVE WHAT THEIR STOCK IS, HOW IT MAY BE IMPROVED, AND WHAT IT IS FIT FOR.”—*Locke.*



STOCKTON, CAL.

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1891.

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1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for consistent and reliable data collection processes to support informed decision-making.

3. The third part of the document focuses on the role of technology in modern data management. It discusses how advanced software solutions can streamline data collection, storage, and analysis, thereby improving efficiency and accuracy.

4. The fourth part of the document addresses the challenges associated with data security and privacy. It provides guidelines for implementing robust security measures to protect sensitive information from unauthorized access and breaches.

5. The fifth part of the document explores the importance of data governance and compliance. It discusses the need for clear policies and procedures to ensure that data is managed in accordance with relevant laws and regulations.

6. The sixth part of the document discusses the role of data in driving business growth and innovation. It highlights how data-driven insights can identify new market opportunities and inform the development of innovative products and services.

7. The seventh part of the document focuses on the importance of data literacy and training. It emphasizes that all employees should have a basic understanding of data and its applications to effectively utilize the organization's data resources.

8. The eighth part of the document discusses the future of data management and analytics. It explores emerging trends such as artificial intelligence and machine learning, and their potential to revolutionize data analysis and decision-making.

9. The ninth part of the document provides a summary of the key points discussed throughout the document. It reiterates the importance of data in driving organizational success and the need for a comprehensive data management strategy.

10. The final part of the document offers concluding remarks and a call to action. It encourages the organization to embrace a data-driven culture and to continuously invest in data management capabilities to stay competitive in the market.



## PREFACE.

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The object that I have had in view in the preparation of this work has been the better teaching of that branch of mathematics whose utility no one questions. Among the masses of the American people arithmetic has been regarded of more importance than any other study in the educational curriculum. Other studies must be neglected, if necessary, in order that it may be mastered. This state of affairs being admitted, as well as the great evil that would result from the neglect of other most desirable branches of study, it seems to be the duty of those most conversant with the temper of our people and the time devoted to arithmetic, to put forth every energy to lessen the time, increase the efficiency, and minimize the useless efforts that attach to the teaching and acquiring of this subject. It is certain that no more fertile field is open in which teachers may reap appreciation for their untiring energies; for, as Agassiz has said, "On the broad high road of civilization along which men are ever marching, they pass by unnoticed the land marks of intellectual progress, unless they chance to have some direct bearing on what is called the practical side of life."

An experience of eighteen years in teaching in country schools, in city grammar and high schools, and in the State Normal School, has enabled me to see and to feel the benefits of good methods and the evils of poor ones. Method is not arbitrary but rational, not inflexible but natural; and he that profits the most by suggestions and by aids is not he that literally follows, but he that digests and assimilates. Rosencranz says: "The peculiarities of the person who is to be educated and, in fact, all the existing circumstances necessitate an adaptation of the universal aims and ends, that cannot be provided for before

hand, but must rather test the ready tact of the educator who knows how to take advantage of the existing conditions to fulfill his desired end." Hence I have aimed, not specifically to put in the mouth of the teacher words and formulæ which he shall brainlessly and heartlessly utter in the pupils' hearing, but rather general ideas embodied in formulations that shall be suggestive to the receptive mind, that shall enable the true teacher to see his own faults and correct them, and that shall open up new fields for growth.

The underlying principle of education is the self activity of the pupil's mind. For the impressment of entirely new ideas the monologue is conceived to be the natural method of teaching; for the enlargement of the thought, the fixing of a concept, and the preparation of the mind for a new principle, the dialogue is believed to be far preferable. The aids are objects in the hands of both the teacher and the pupil; many and varied in the hands of the small child and gradually decreasing in number and variety as the mind of the child becomes the storehouse of faultless concepts drawn from objective percepts. While counseling against eccentricity, I would, in the interest of a live school and a progressive teacher, commend the following from Tate: "As children love change and novelty, a good teacher will vary his subjects of instruction as well as his methods of instruction accordingly; his judgment must be exercised in selecting those methods which are most suited to the existing conditions of his school."

As the work in numbers progresses and when all that is fundamental, the simple number and the fraction (with its variations, decimals and per cent.), have been thoroughly comprehended by the pupils, the hand of the teacher should rest more and more lightly upon the pupil; hence the pupils are encouraged to make original investigations, under direction of the teacher at first, into such subjects as Commission, Banking, and Taxes, and report for class consideration what they have learned. Harris says: "All teachers must keep in view the standpoint of the pupil, use illustration, and supply necessary steps to make the connection clear to the pupil. The live teacher is careful to avoid being hampered by the limits of any one method, although he finds use for all on occasions."

It is suggested that the teacher in making use of the methods

herein outlined keep in mind that a second step should not be taken until the first has been thoroughly made; to that end it will be found necessary to multiply explanations, questions, and exercises, and to vary the same as much as possible.

In written or blackboard work, the end sought should be short solutions and clear oral explanations. This end is most readily reached by having the pupils compare and criticise both the solutions and the explanations. This exercise awakens renewed interest, and is always a feature of a well conducted school.

The arrangement or order of presentation of subjects, it is thought, will commend itself as being based upon psychological principles. The supply precedes the demand.

It is assumed that the teacher aims to be as useful as possible. To be as useful as possible he must be progressive. He must commingle with the world with his eyes and ears open. He must be sociable. He must be high-minded, honest, truthful, and moral in all respects. He must not forget that he is the cynosure of the school and of the community. He must read educational periodicals, and must study psychological and pedagogical literature, and test its teachings by his experience, and his experience by its teachings. He must explore the vast domain of general literature, for his own growth and that of his school. He must be faultless in the subjects he is to teach, as regards his technical knowledge. To such as are endowed with industry to pursue such a course, this book is sent with pleasure. In their hands the pupils will grow to honorable manhood and true womanhood.

State Normal School,  
Chico, California,  
August 4th, 1891. }

C. M. RITTER.