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Pestalozzi and His Principles as Exemplified in American Methods of Teaching.

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PESTALOZZI AND HIS PRINCIPALS AS EXEMPLIFIED IN AMERICAN METHODS OF TEACHING.

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PREFACE

While it is true that this thesis deals only with the development of Pestalozzi's methods in our American system of teaching, and that of arithmetic alone, yet the writer feels that in order to make the discussion clear and intelligible, the life of Pestalozzi must be taken up briefly. Consequently, a short space has been devoted to the life and other incidents relative to the life of the subject of this work.

It must be remembered that an effort has not been made to exhaust the subject discussed here, but the writer has attempted to give a brief and concise argument, showing how the great educator has been instrumental in bringing about many of our most valuable methods in elementary teaching of arithmetic.

In the preparation of this work, the following authorities have been consulted: Johann Heinrich Pestalozzi, De-Guimps; How Gertrude Teaches Her Children; Pestalozzi, Krusi; Leonard and Gertrude, Pestalozzi; Pestalozzi, Pinloche; Pestalozzi, Quick; The Teaching of Elementary Mathematics, Smith; A History of Mathematics, Ball; Study and Teaching of Mathematics, Smith; Study and Teaching of Mathematics, Young.

CONCERNING THE LIFE OF PESTALOZZI

No name has played a greater part in the history and development of education than that of Heinrich Pestalozzi. Born in Zurich, in 1746, his entire life was to be spent in a great purpose and to uplift the people of his day, as well as those of days to follow, from a position of poor education to a position of real education.

When Henry Pestalozzi was five years of age, his father died and left a widow with three children, two boys and a girl, to bring up. This mother's sympathy, kindness, and fondness for her children had much to do with, and most likely accounts for the greatest principle in all of Henry's later ideas,--that of bringing about a closer home relationship between the home and the child. Since it is obvious that the training of his early life had such a marvelous effect on his later life and work, it might be wise to speak briefly in this connection. His mother, Susanna Pestalozzi, was a lovable, kind, and sympathetic mother and was also a gifted woman. She had been splendidly reared herself; and no doubt it was due to this fact that, after her husband died, she refused to go to live with her brother in a nearby city, but chose to remain in Zurich, that she might give to her three children the type of training that she had gotten.

Pestalozzi, who was in his youth delicate and sickly, possessed a nervous temperament, which rejoiced in mental activity. He says: "My feelings and imaginations were so predominant that I neglected many things. I often committed blunders, which got me into more scrapes and troubles than any other child of my age, but I possessed a light heart, which made me forget my small suf-

ngs after a few hours." This quotation explains many of the
ts that we find displayed in his entire school life, for we
that he never attempted to learn anything from memory or
ation. He preferred those subjects in which his originality and
;ination could have full sway, and in these he usually excel-

The real values of Pestalozzi's life were in his heart and
wonderful imagination. Anxious and ready to catch the re-
ion between things, he was very inattentive, absentminded,
often exceedingly careless concerning material things. At
s time he knew or cared little of family and social life, and
is due to this fact that he suffered many bitter disappoint-
ts in later life. These disappointments began just as soon as
began to go to school. He showed great promise and often
eared to be very serious, yet his inability to write and spell
rectly held him back continually. Concerning these facts
talozzi writes: "The failures which would have sadly troubled
ier children scarcely affected me. However much I might have
aded or desired anything, when it was once over, and I had two
three nights of good sleep after it, if it concerned me alone,
was just as though it had never been. From my childhood, I
ve been everybody's plaything. My education, which gave food
all dreams of my fancy, left me alike incapable of doing what
erybody does, and enjoying what everybody enjoys. From the very
rst, little children, my schoolfellows, sent me where they would
ther not go, and I went; in short, I did all they wanted. More
an any other child, I was always running my head against the wall
r mere trifles; but it did not trouble me. I thought I could
many things which were quite beyond me; I measured the whole
rld by my mother's house and my schoolroom, and the ordinary

life of men was almost as unknown to me as if I had lived in another world." Thus we see the boy suffering at the hands of his playmates because he could not adjust himself to his surroundings. The first few years of his life had been spent in his home under the tender care of his mother, and this condition made it difficult for young Pestalozzi to make himself congenial with his fellow students.

At the time when Pestalozzi became of University age, the University of Zurich was at its very best and most progressive work. The philosophy of Wolf, a recent scholar, began to stir up the minds of the young men at this time and Pestalozzi did not escape. It was this philosophy that caused him to enter the profession of the ministry and law and thus delay the great day when he would enter his real calling, that of advancing and promoting educational principles.

The three branches of study that were emphasized at Zurich University were theology, law, and medicine, and the most distinguished professors of the continent were to be found within its walls. It was their plan to create a great spirit of zealousness among their students, and at this they succeeded remarkably well. Among the most noted teachers at Zurich were Zimmerman, Breitinger, and Bodmer. All three of these men were influential in shaping the life and future of Pestalozzi; and he often speaks of his valuable experience obtained under these men. Bodmer, professor of history and literature, did much to create in young Pestalozzi the love for literature and reading that served him to such good advantage in later years. To this same Bodmer belongs much of the credit of starting a movement that has given to Germany much of her great literature. The influence of this small coterie of professors on their students was such to cause them to despise

all forms of wealth and ostentatiousness, and care only for justice and truth. They thought nothing of bodily comfort, and Pestalozzi himself frequently slept on the bare ground for many nights in succession and during this period they lived on the coarsest kind of food. This was the kind of feeling and spirit that Pestalozzi encountered when he came to Zurich University. Pestalozzi had not had sufficient training to take up university work, but he was determined to continue his studies and succeed, even if he was at a disadvantage. Referring to his courses in the University, he says: "The spirit of the public teaching in my native town, though eminently scientific, was calculated to make us lose sight of the realities of life, and lead us into the land of dreams. All the best of us, Lavater not excepted, were mere dreamers. We were taught to despise the external advantages of wealth, honour, and consideration, and to believe that by economy and consideration, it is possible to do without many of the things considered essential by the ordinary class of people." Indeed this was a dream, and no man was ever a more complete victim to any theory than was Pestalozzi. Victim as he was, it was this fact that made him the greatest of all reformers and leaders in educational thought.

When Pestalozzi began his career, he chose the field of the ministry as his profession. He spent quite a little time in preparing for this work, but upon trying to preach for the first time, he broke completely down, and became so disgusted with himself and his work that he resolved to give up his work immediately. He now decided to direct his attention and study to law. He had always been a strong and ardent defender of the poor and oppressed and now he thought he saw his opportunity to do a great work. He had seen the poor peasants of Zurich punished unjustly and one day he was heard to say: "When I am big, I shall support the peasants;

they ought to have the same laws as the townspeople."[8] At about this time Rousseau and his writings were being severely criticized generally. Rousseau had thrown a bomb into the camp of certain schools of thought by his attack upon the social and family life of the time. His ideas seemed absolutely absurd and impossible to them, and it is largely due to this difference of opinion between Rousseau and Pestalàzzi that caused the latter to give up his profession as a lawyer.

Having chosen to direct his studies in another direction, Pestalozzi now chose the calling that he had been born to follow--that of philanthropist and educator. The needs of the poor classes of Switzerland had ever been foremost in his mind, even when he was practicing law. Now he was determined to direct his entire life and all of his resources, physical, mental, social, to the education of the poor classes of his native country.

He had watched with an eagle eye how the poor people were oppressed by the upper classes; he had seen them suffer unjustly oftentimes; he had seen them give their rights and property over to their masters without any justification whatever; now he saw an opportunity to right this criminal injustice and determined to risk all in the great undertaking. He attempted to get his ideas of reform before the people through the newspapers, but owing to the fact that political and social questions could not be discussed in public at this time, his efforts were in vain. He did succeed in publishing some of his more conservative ideas. The following is an example of these: "I am told nearly every day that a young man who occupies such a very important position in his country as I do, should attempt neither to criticize nor make things better; that both are beyond his

province. I may, however, be allowed to express my wishes; this at least nobody can either forbid or find fault with. I propose, then, to formulate my wishes and print them for everybody to read. As for those who may make fun of me, I can only hope that they may soon learn to know better." Thus we see a great man, a preacher in the wilderness to be sure, yet whose ideas could not be expressed in public because of the unappreciativeness of his own people. But such a mind and genius could not be smothered, and we soon find him demanding the respect and attention of his follow men. In another chapter we shall see how, when, and where these theories were put into practice.

PESTALOZZI'S AIMS AND METHODS

No educator of ancient or modern times has contributed more to modern education than has Pestalozzi. Many men had dreamed and advocated his ideas and theories before him, but he alone put them into active operation. Pestalozzi's aim, as expressed by himself, has stood the test of educators since his time. "The aim of education", he says, "is to develop harmoniously all the powers and capacities of the human being." This aim has often been attacked and criticized, but it is universally conceded to be the best idea yet set forth as to the real purpose of education. "Man's powers" says he, "are not due to art or chance, but to nature, and education should follow the course laid down by nature". Present education, according to Pestalozzi, gives to the child mere ability to read and write words, to memorize a little mathematics and a few other courses that add nothing of real value to the education of the child. "Our schools", says he, "are essentially only artificial, stifling machines for destroying all the results of the power and experience that nature herself brings to life." After the children have enjoyed the happiness of sensuous life for five whole years, we make all nature around them vanish before their eyes; tyrannically stop the delightful course of their unrestrained freedom; pen them up like sheep, whole flocks huddled together in stinking rooms; pitilessly chain them for hours, days, weeks, months, years, to the contemplation of unnatural and unattractive letters, and, contrasted with their former conditions, to a maddening course of life." Such was Pestalozzi's criticism of the prevailing methods in education during his time. He saw the defect in the present system and went directly to the work of

correcting it.

First of all, he maintained that observation, or sense perception, was the foundation of all learning. He held that the great amount of memorizing that was being demanded of children of his time was absolutely useless and would continue to be so until the idea of sense perception was adopted. By this he means that a child could learn a certain principle much more quickly if he could get a visual image of that object that he was trying to learn. For instance, if he were studying a certain animal, the best way to impress the characteristics of the animal upon him would be to let him see the animal and thus learn by actual observation. Language and observation must be connected and associated at all times, said Pestalozzi. Perhaps no idea of Pestalozzi had more influence and direct bearing on the results of his teaching than his idea of observation and analysis. Language could not be learned entirely from books or by rules, but could be learned only by conversation.

Some of his most essential pedagogical principles are:

(1) Sense-impression is the foundation of all instruction.

(2) Language must be connected with sense impression.

(3) The time for learning is not the time for judgement and criticism.

(4) In each branch, instruction must begin with the simplest elements, and proceed gradually by following the child's development; that is, by a series of steps which are psychologically connected.

(5) A pause must be made at each stage of the instruction sufficiently long for the child to get the new matter thoroughly into his grasp and under his control.

(6) Teaching must follow the path of development, and not that of dogmatic exposition.

(7) The individuality of the pupil must be sacred for the teacher.

(8) The chief aim of elementary education is not to furnish the child the knowledge and talents, but to develop and increase the powers of his mind.

(9) To knowledge must be joined power; to what is known, the ability to turn it to account.

(10) The relation between master and pupil, especially as far as discipline is concerned, must be established and regulated by love.

(11) Instruction must be subordinated to the higher end of education.

All of these principles Pestalozzi attempted to put into actaul practice at his institutes that were organized at different periods in his life. At the ripe old age of eighty years, he tells us, in his Song of the Swan, how these principles were uppermost in all his aims throughout his entire life.

It was indeed a bold as well as beautiful thought that prompted Pestalozzi to ask the mothers of his day to begin the training of their children from childhood up right in their own homes, and thus merely extend a training that was based upon maternal instinct. But this very thing the ardent man insisted upon. In order to bring about his desired results, he must persuade the mothersto turn their faces away from the very methods by which they had been reared and trained. They must forget themselves, so to speak, and adopt themselves to conditions that were absolutely contrary to their former training. They must act as if

they had been trained under Pestalozzi themselves.

Krusi, Pestalozzi's assistant, wrote the Book for Mothers, under Pestalozzi's supervision and here he set forth some of his theories concerning the early education of the child. He says, "When the child is still but a babe, his mother takes him to the open window, and he sees the sky and earth, the garden before the house, trees, houses, men and animals; he sees things near and things in a distance, great things and small things, some standing alone, some in groups; he also sees white and blue, and red and black. As the months go by, his mother takes him with her still more; he at least comes near to the houses, trees, or steeples, that hitherto he has seen only from afar. He tries to take hold of everything he sees; he picks up stones, and breaks the bright flowers from their stalks. And now, mothers, what have you to do all of this time? Nothing but follow the course that Nature and Providence are laying down for you. You see what objects God presents to your child as soon as he opens his eyes."

Here we see fully outlined the theory concerning the early education of the child as set forth by Pestalozzi. This was one of his greatest ideas concerning the reforms in education, and none received more of the educator's time and attention.

PESTALOZZI'S INSTITUTES.

No discussion of Pestalozzi would be complete unless the various institutes which he founded and operated are taken into consideration. In these institutes he put, or attempted to put, into active practice those principles that he had been championing so ardently all his life. The names of at least four of these schools are familiar words to all who know anything of Pestalozzi, and we shall give only a short space to their discussion.

His first school was begun at Neuhof (New Home) in 1771. Here Pestalozzi settled himself with his family in an incompleted, rough, one-story house, but perhaps not so far out of keeping with his idea of humbleness and plain living. This school was to be run from an agricultural point of view, consequently, Pestalozzi secured a right to an immense tract of land near by, and here his farming experiment began. Here, as in all his enterprises, his lack of judgment and foresight seriously handicapped him, for we find him suffering right at the beginning from lack of funds and supplies. Instead of preparing all of these before launching such a tremendous undertaking, he undertook the project without one cent of capital, trusting to luck and charity to sustain him. A friend criticizes him in the following manner: "A man who contemplates and measures the stars, who gives himself up to the most profound speculation, who has the best and finest feelings, but who has not a mind for any of the details of human life, or for domestic necessities, who, in his thoughts at the stars, stumbles into a quagmire at his feet, who cannot either talk nor act with any of his fellow-creatures without

offending them by his unpleasant exterior and his uncouth, disorderly ways--how could such a man ever hope to succeed in actual life"? Such a denunciation, while perhaps a little severe, still gives us a fairly correct picture of the master of Neuhof.

The farm-school went well for a while, but eventually began to deteriorate under the bad management of its master. He had now turned his school into a more strictly charitable institution than it had been in the beginning and now began to draw in the poor and needy children from the neighboring sections. These he put towork in his spinning mill that he had recently built, and in this manner they partly sustained themselves while in school. This served as a great stimulus to success at Neuhof, for visitors and friends became more liberal with their words of praise and friends began to pour in from all sides. When these funds were used, however, conditions became as bad as ever. Extreme poverty soon prevailed among all of those at Neuhof. Pestalozzi himself says: "For years I lived in the midst of fifty little beggars, sharing in my poverty my bread with them, living like a beggar myself in order to teach beggars to live like men." Having appealed again and again to the public for financial aid and having obtained none, Neuhof was compelled to turn its charges out and close its doors in the spring of 1780, and thus we see Pestalozzi's first dream of a real school shattered.

Pestalozzi was not the leader to be daunted by a single failure. It is true that he had failed, and failed completely, nevertheless, he was strong in his conviction that his theory was practical and sound and would triumph eventually.

He appealed to the Swiss Directory for advice and aid on a second attempt of establishing an institute. It had now been eighteen years since Neuhof had been closed, and since that time Pestalozzi's mind had been completely occupied with a second attempt. His plans had been formulated, his methods worked out, and these were analogous to those set forth in Leonard and Gertrude.

His request to begin another school was granted by the Directory, and at Stanz, the capital of Nidwalden, in December, 1798, the project began. The quarters here were poor to be sure, but much better than at Neuhof. Pestalozzi was extremely enthusiastic over the movement and remarked at the time to a friend: "My eager desire to put my hand at last to the work of realizing the dream of my life would have made me ascend the highest Alps. I could almost say, would have made me begin without fire and water, if I were allowed only to begin." Soon the children began to pour in and instruction began. Moral, physical, and mental education were all included in this new curriculum, taught with more or less correlation. The teaching of morality, limited to the notions of right and duty, was above all practical, and founded, according to Pestalozzi's principles, on conceptions gained by the medium of sense-perception; that is, he connected it with the actual experience of the child. He taught all things from the actual occurrences in the daily life of the child.

The work at Stanz was successful from the very beginning and the government officials as well as private citizens were loud in their praises of Pestalozzi and his accomplishments. "It is astonishing", writes a representative of the government, "to see what this excellent man has done, and the great pro-

gress made in so short a time, by the pupils, who are most eager to learn." The people could not comprehend how such great results could come from the work of one man, especially such a man as Pestalozzi. As the months passed, however, patrons began to criticise and lose faith in the master of Stanz, and while no man ever deserved the accusations less than he did, still they were so strong that he determined to abandon his work. The close was hastened by the fact that the French troops, who were engaged in military duty in the territory of Stanz at the time, took over the school buildings for a military hospital. "That was the reward of my work at Stanz", wrote Pestalozzi sorrowfully, "work which perhaps no mortal man every attempted on such a scale and under such circumstances."

Perhaps the best known and most studied of all of Pestalozzi's attempts at founding schools, that of Burgdorf easily takes first place. Pestalozzi had been a teacher in the small schools of Burgdorf, and when he appealed for funds and permission to begin there, the request was immediately granted him. His work at Burgdorf was begun just as he had begun at Stanz; that is, he began to teach empirically, with neither plan nor method. "I crowded", he says, "my A. B. C. everyday from morning till night, put rows of syllables indefatigably together, filled whole exercise books with columns of them and columns of figures, and tried in every possible way to bring the rudiments of reading and arithmetic to their utmost simplicity, and into forms contrived by the greatest psychological art to bring the child very gradually from the first step to the second, but then in uninterrupted continuity from the foundation of the absolutely comprehended

sedond, quickly and surely to the third and fourth".

At the close of the first year (1800), the Board of Education visited Pestalozzi at Burgdorf and wese very favorably impressed with the progress that was being made there. In their report, which they addressed to the master, they landed him highly and commented at length on the fact that he, in eight months, had taught children to read, write, and draw with great precision, a result that had usually takan three or four times as long to accomplish. About the time this report was made, Krüsé, a school teacher of much versality and ability, was located by Pestalozzi. He persuaded him to cometo Burgdorf and become a member of his small coterie of teachers. It is interesting to note that this Krüsé is the father of the young Krüsé who came to America many years later, and working with Horace Kamin Massachusetts, brought about such marvelous educational reforms in the entire United States.

Burgdorf lasted but three and a half years, when an abrupt change in political affairs of Switzerland made it necessary for the government to demand that Pestalozzi give up the Castle of Burgdorf. This he reluctandly did and moved into an old building at Münchenbuchsee. Finding it impossible to conduct his school in this unsuitable location, he transferred his entire outfit and all of his pupils to Yverdon, and in 1805, began his fourth and last attempt along these lines. Here, the number of pupils and the teaching force also increased and the school be an to prosper in a larger degree than any of the others had done. Pupils came from a distance to be registered in this popular institution. The work carried on here was a continuation of the work that

had been begun and carried on at Stanz and Burgdorf. It was done equally as well here as at either of these places mentioned. The simple branches were taught and the idea of sense-perception was emphasized to a great degree.

Accomplishing as much good as it was, the Institute, after twenty years of service, went to pieces as its predecessors had done before it. Its fall was due largely to the business ineffieiency of its master. Thus we see the last effort of Pestalozzi pass away and his splendid dream of an institute ended.

THE GROWTH, APPLICATIONS, AND LIMITATIONS OF PESTALOZZI'S METHODS AS EXEMPLIFIED IN AMERICAN ELEMENTARY TEACHING OF ARITHMETIC.

In any study of the development and aims of a subject, it is necessary to know something of the early history of that subject. Arithmetic, as it was taught among the ancients, was taught for its utilitarian value. Especially was this true in the East among the Chinese and Hindus. At first, this subject was taught in schools with other subjects, but as the need for it became more and more potent, separate schools were set up for it, and so we have in the middle ages a rapid growth of arithmetic. For two thousand years it has been taught in the far east for its practical value; as it could be used in actual, everyday life.

In Greece, arithmetic was not by any means popular, and never received any great stimulus from the state. The Grecians were a people who had no need for arithmetic since their occupation led them in other channels. They spent much time in training for war and had little time and need for this subject. Socrates and Plato believed in it, but expressed fear that some day it would be taken up by their people and carried too far.

In Rome, the subject had more chance and favor, but even here it was studied only for its utilitarian value. They were a practical people and demanded this as a practical subject. Great and mighty conquerors they were, and they were forced to give it to their people in a practical industrial education.

All along through the middle ages, there was a great amount of interest in commercial arithmetic. Its utilitarian value was

freely stressed and magnified. Italy was the center of this interest, but it eventually began to move north into France, Germany, and Austria. Church rule had almost overshadowed this science for a time, but now the people came back with a vengeance and took up the study anew. So completely had the study become commercialized, that Johann Sturm, in 1565, failed to include arithmetic in his ten years course.

And now we come to the everlastingly disputed, never-to-be-settled question, "Why is arithmetic taught?" The answer divides itself into two parts, in the first place, it is taught for its cultural value. The first is easy to define, for the results are clear, concrete, and tangible. It is the process of learning arithmetic because it enhances our chance to earn a better living; in other words, we might term it the "bread and butter value". The second value is not so easily defined. Here it can be brought to play upon ethical, religious, and philosophical thoughts and ideas. Both of these values have been treated differently, and both have often been over estimated. The practical point of view is sweeping everything before it today and has about swallowed up the cultural value. Now, can we justify the teaching of arithmetic beyond its practical elements? We maintain that it is a "logical exercise", and on that ground, clear it of its accusations.

But this is not the question with which we are primarily concerned. Our purpose now is to see how Pestalozzi's methods in arithmetic compare with the methods of the present day. Or, we might put it differently and ask, "How has Pestalozzi's methods been brought over in our present system of education? Has his ideas been outgrown, and if so, to what extent? This is the question for us to discuss, and is the real question at issue in

this paper.

Generally speaking, we are prone to speak of Pestalozzi as being the first educator to put forth the idea of sense-perception, or teaching by observation. Such was not the truth, however. We find that this method was in vogue among the people of the Western world, until the Hindu numerals began to be used in 1500 A. D. Now the Christians became so enthusiastic over these new methods that they discarded all forms of object teaching and were in serious danger of losing the art completely, when Pestalozzi appeared upon the scene about three hundred years later and saved the situation. Three or four centuries prior to Pestalozzi, it was the custom to study and learn the rules as put down in the book, with little regard to the thing itself. Unfortunately, this custom still prevails in some of our schools, but due to the recent development of our school system, it is rapidly being rooted out. The educators of that day began to see that the whole idea of so much memory work was fatal to the development of the child, and many of them, two being Locke and Ascham, held that such a firmly established custom could not be overcome without difficulty. However, some concession was made, and the arithmetical rules were put in rhyme so that they could be memorized more easily. This is not entirely foreign to our own country, for we find that one of these rhyming arithmetics appeared in New York State nor many years ago. Thus we find form replacing substance, and as a consequence, the whole thing takes on a mechanical aspect.

Pestalozzi now comes along with his ideas and conceptions of education. Teaching by object was his chief method. He pro-

ceeds from particular objects to general reflections, and never fails to select topics and objects in which the children are intensely interested. He is careful, however, to make his discussions clear and forcible to the child, and should he be compelled to touch an abstract idea, he is careful that this be led up to by using a concrete object as a starting point. The children were taught to observe carefully what they saw, and when they attempted to describe it, Pestalozzi was very careful that every detail was to be absolutely correct.

In learning any new principle, the child was taken from the very beginning and taught by steps and advanced just as he was able to do the different steps of the subject studied. In learning to draw, he would have them take pencils, rulers or sticks and place them in a long row, some rows crooked, some curved, and some straight. Now they were required to draw lines corresponding to these lines of sticks.

Pestalozzi held that no real or sound judgment could exist independent of sense perception. No judgment has matured unless it has done so by sense perception. Any child, who has observed that two blocks added to two more blocks make four blocks, has acquired a principle that will hold so long as he lives and which will never give him any more trouble. He will always know that two plus two are four. All number work, Pestalozzi based on sense perception. He was not a pioneer in this matter, however. It had been worked upon and advocated some time before, but had never accomplished a great deal, so it was left for the brain of Pestalozzi to give it real shape and life. He held that figures should not be taught to the child until the numbers are all familiar to him. Would we teach, or attempt to teach a child

letters who could not talk? The two cases are parallel. Number is the first and prime thing the child must learn in arithmetic and he must get this by sense-perception.

Concerningthe teaching of fractions, Pestalozzi adopted Ratke's methods: "First a thing in itself, and then the way of it; matter before form". His first and fundamental aim was to get before the child a concept of what a fraction was, then give actual fractions and have the child become familiar with them by dealing with them.

Arithmetic, to Pestalozzi, was essential because he held that a child should be able to demonstrate any thing that he said, and this could be done only by arithmetic. Thus we see a fallacy in Pestalozzi's teaching. All that a child learns can not be proved by a knowledge of all subjects, for some things in the abstract do not lend themselves to proof.

Pestalozzi's idea of oral arithmetic as a mental gymnastic was perhaps one of the worst aspects of his teaching. He carried this to an extreme that was as amazing as it was harmful. It did not prove to be a mental exercise or stimulant as was claimed for it, but was largely a waste of time. His number and units tables were carefully prepared, but by no means accomplished what they were supposed to have accomplished.

In all of his teachings, Pestalozzi was careful that the instruction should be conducted by employing successive steps to lead up to a knowledge of the subject. The child must learn to group and organize his perceptions in a logical way before he is able to go on into more complicated matters. In every study, a set of successive steps must be formed, and thereby have each new idea have only a little more difficulty attached to it than the one preceding it. One can strengthen the importance of ob-

jects and things by bringing them closer to oneself and allowing the senses to act fully upon them.

In arithmetic, as in all other branches, Pestalozzi did not believe in answering too many questionsfor the children. No one realizes today better than Pestalozzi realized in his day, that real thought is secured by having the child ask and answer his own question. The questions were put in a manner that produced thought and left the child in no doubt as to the correct answer of the question. Unfortunately, this principle is often violated today and questions are put in a manner that tends to smother any seeds of thought rather than encourage or promote them. It is probably ture that modern teaching suffers and has suffered for years from just this kind of teaching more than any other cause. Much of the success of good teaching in Pestalozzi's day came as a result of keeping this law.

Another principle set forth and practiced by Pestalozzi in his teaching of Arithmetic, and in fact in all of his subjects, was the great value of play in education. He held that all education could be gotten through this medium. All studying could be so correlated with play and the idea of matter could run through, and temper, so to speak, the entire process. The most difficult lesson, according to Pestalozzi, can be learned through this principle. He held that there is no reason why we should make such a distinct line of demarkation between work and play in our school life. So much of the child's time in school is made unpleasant for him because the teacher stands over him as a monarch over his subject and gives the child no freedom of action or speech, whatever. Such a condition is detrimental to proper teaching, and not only that, but good teaching can not be done where such a condition exists. The entire attitude of the

pupil is changed when the spirit of play enters into his work and the work of the teachers; the former's mind is in a receptive mood; his interest is aroused, and everything about him is conducive to learning many times as rapidly as when a feeling of drudgery and compulsion is shown and forced on the child by the teacher. This exclusion of all play from the classroom was the early ideal of education. Now if they had desired to educate a race of slaves where compulsion was present in all things, such a system would have been beneficial. But such is not the aim of education in any branch. Pestalozzi could easily see that the old text-book method of teaching in arithmetic, and not only this subject, but others as well, was by no means accomplishing the desired end. The cold, dry-cut method of strictly following the textbook and firing questions at the pupils was not his method of teaching. He realized fully that such procedure was not securing the best results, consequently he began his great movement to prove the value of the element of play in the school.

Pestalozzi had many followers who took up and successfully carried out his institutions. Among these, Tillich, Turk, and Grube perhaps stand out most prominently. The former set forth the following maxim: "Denkend rechnen und rechnend denken", which means, "thinkingly to mathematize, mathematically to think". He did not wholly agree with Pestalozzi's methods and his ideas and consequently determined to rectify them. His plan was to have the child get a thorough ground work for his education and then all would be fairly easy for him. He surpassed Pestalozzi's teaching in that he emphasized the decimal system, something that had not been stressed up to this period. Grube carried on the sense perception method of his predecessor, and other than that, does not demand our attention in this work.

John Turk advocated the idea of "formal training" and believed that the child should be trained to think above all else. Thus we see the methods and aims that were in vogue in the teaching of arithmetic many years before Pestalozzi's age, during his lifetime and also after his death. We find both virtues and faults couched in these methods. There were many to be condemned, likewise, there were many to be praised. But be this as it may, we must admit that the teaching of arithmetic at the end of the eighteenth and at the beginning of the nineteenth centuries was far more in accordance with our modern conception of pedagogy than it had ever been before. Now going back to our original question, has Pestalozzi's ideas, aims, and methods been brought over into our present teaching and outgrown, and if so, to what extent?

Unhappily, the present aim for teaching arithmetic cannot be very clearly and definitely stated. This fact is true because there are so many aims advanced by students of the subject, and while every definition seems to be fairly satisfactory, as it covers the subject, still there is a difference between each one. Johann Herbart, the father of the famous doctrine of Apperception, defended the aim of teaching arithmetic in terms of its ethical values. He is refuted here by many students of pedagogy who say that is has absolutely no ethical worth. Some say it stimulates and produces mental activity, some say it does not; some say it trains in the use of language, while others maintain that it serves to increase a logical mind and trains to think consistently and accurately. For us, however, the aim of teaching arithmetic in our American school is, or should be, to train the child in the mastery of figures and numbers that will be of a practical or everyday value to him in later life. This aim seems to cover

the ground for which arithmetic should be taught.

The fundamental principle in the method of teaching primary arithmetic has its root in the essence of number.[1] The modern teacher must deny that a number can ever be an object of sense perception, yet this idea has been held for centuries, and unfortunately, is held by some today. It is obvious that to the intelligent teacher this cannot be true. Pestalozzi had a clear conception of this principle. So enthusiastic did he become over the observation method that he maintained that practically everything was seen and learned by sense-perception. But we believe that the idea of number is perceived, not by observation, but by the activity of the mind. The mind, or brain, must reach out, so to speak, and grasp the thing. There must be activity in order to get this idea of number, and this activity must come from within. Thus we see an advantage gained over the older conception of the eighteenth century and before that time. Again, it is absurd to speak of seeing number. We can see only the symbol or mark that stands for the number. Number is not a tangible or concrete thing. We can see twenty rabbits, but we cannot see the number 20. We do not know there are twenty rabbits there because we have such a thing before us as twenty, but because we have counted them and found a certain number of rabbits present and this number happens to be twenty. We see a group of children and we say, "There are five children". These children are doubtless very unlike in appearance, yet we put them all in one class and call them "Children". We, however, assume them all to be more or less alike and of the same species. This

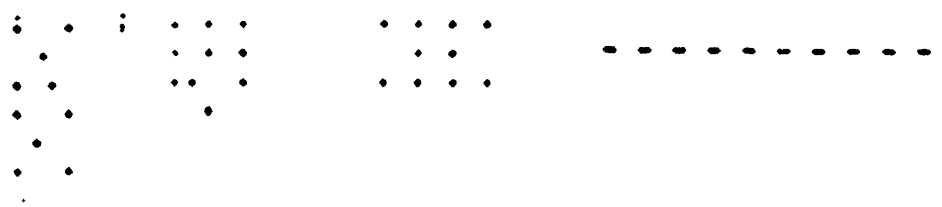
1.(The Teaching of Elementary Mathematics---Smith:pp99).

is the basis of the sense-perception of number.

While the modern method of teaching arithmetic has taken us far away from the idea of sense perception of numbers, yet few teachers attempt to teach this subject without the observation of objects for the purpose of illustrating the subject they are teaching. Pestalozzi's idea of what kind of objects to choose for this purpose has been taken over in our modern teaching to a large extent. He advocated the use of simple, plain objects, objects nearest at hand. One divergence, however, between his method and the modern method, is that the use of the fingers in calculating is now absolutely forbidden. It is maintained that this practice tends to weaken the pupil and make him too dependent upon objects for his numbers.

Pestalozzi often practiced using the object entirely too long in his training, but this has been remedied in recent years. At present, the object is dropped very early, just as soon as he gets a conception of the thing to be learned.

It has been proved that by placing a certain number of numbers in certain positions or groups, the child can recognize them in other positions. For instance we take ten spots in the following groups:



And we find that some of these groups can be recognized much better than others. This proves to us that our conception

of number does not come to us from groups, but comes as a recognization of the position and location of the various members of these groups. The childrust get his first conception of number just as the world did and that is by counting things. This principle was not fully recognized in the early history of education and has proved an immense step forward in the progress of teaching arithmetic. Having gotten the child to think in terms of concrete examples, it is not a difficult task to get him to transfer this power of thinking over to things of abstract nature. In other words, it is easy for him to substitute for the reality of things the things of reason, born of his own mind. Thus we see the great importance of the early handling of numbers. Happily, this process is well taken care of in most of our modern teaching of arithmetic, yet there are a few who still cling on to the old, impossible method. We cannot hope for a complete renovation at once, but rust expect it to come about by degrees.

Let us see just how this process works as applied in our present day teaching. We began to solve a certain problem in arithmetic. Next, we begin by substituting for the concrete objects expressed in the problem, certain symbols. Now we are forced to confinecur thoughts largely to the symbols and abstractions. Now after the work is completed, we pass from the abstract fact to the concrete or real objects and have our answer. To sum up this process, we might say that the prime factors are as follows: (1) To pass to numbers by abstraction. (2) From here we pass on to symbols; we work the problem and our result is expressed in symbols. (3) We substitute the proper number for this par-

ticular symbol and thus our problem is completely solved. Thus we work from the abstract to the concrete. Many teachers express great fear that the child may learn to think in terms of symbols and not of numbers. This fear is unfounded, and is really a fear that the child will learn some arithmetic. The child must think in terms of symbols if he is to learn.

All of these theories were in Pestalozzi's mind, but he had not the space or time to develop them. He probably carried the object method too far at times, yet we have not a cause to complain of the fact, for he gave us the idea to begin with. Many teachers of today carry this sense-perception idea too far, while many fail to use it all. Where shall we draw the line? There is a line of demarkation. There is a proper medium, but who can say where it is or should be? The good teacher is the one who knows where, when, and how to begin the object method, and likewise, knows where, when, and how to stop it. Fortunately, we have many such teachers in our schools today, and owing to the recent advanced requirements of the State Boards of Education throughout our country, the number is rapidly increasing. The good teacher of today should have in mind a few principles when teaching arithmetic and should be guided by them. A few of them are:

1. Have the child practice counting objects, thus becoming familiar with numbers.
2. Have him familiar with the series of number, and have him learn these outside of actual concrete examples.
3. The idea of the relations between numbers, or ratio, should be taken up early in life.
4. Remember that the child will learn by intuition of the correspondence of symbol, number and name of things, and that

he will soon be able to drop the pure concept of number out of his real calculations.

Pestalozzi's idea concerning how a lesson should be developed has been brought largely into our present system of teaching, somewhat modified, yet retaining many of its original features. He advocated, just as we do today, that the method of development should be; 1. Preparation; 2. Presentation; 3. Association; 4. Condensation; 5. Application.

We recall from a previous discussion that Pestalozzi debated the question whether it was better for the child to learn the Hindu numerals along with the numbers themselves. He decided that this learning had best be postponed for a time. Many educators of today agree with him in this respect. Some claim that the numbers and symbols should be learned together, as, IIII and 4, so that the connection between the two may readily be seen. Most teachers disagree on this point, and it is not our intention to offer a solution, for it seems to be one of those never-to-be-settled points of pedagogy.

The aim of teaching elementary arithmetic has changed considerably within the last generation. A short time ago it was taught for its scientific value. Obviously, only those who expected to use such knowledge in further pursuit of scientific subjects were benefited by this method of instruction. It was taught as a foundation for greater and larger education, and took no account of the great host of poor, unfortunate boys and girls who could not follow out this plan of higher education, but must be content with what little they could receive while in the grades. We can easily see the illogical effect of such an idea. Now this idea was both

pre and post-Pestalozzian, for it was in vogue before he lived, and while he did much to counteract it during his lifetime, yet he did not accomplish such a result.

Right on down from Pestalozzi's day, until quite recently, and even today, we find the teacher teaching the child with absolutely no regard for his future life or occupation, but giving him cold, scientific facts, facts that can never be of any practical benefit to him. Facts were presented as they chanced to be classified in the teachers mind. They were presented logically rather than psychologically. They failed to recognize the fundamental pedagogical principle that activity and interest on the part of the pupil is the only real basis for learning. We find them spending a long time on partial payments, minsurations, stocks and bonds, cube root, etc., with but little results. These principles, if correctly taught are good enough, but even then, entirely too much time is spent upon them. Children are held day after day and are forced to work on principles that they can never even hope to put into practice. Comparatively little attention was paid to the more practical side of arithmetic, such as interest, decimals, profit and loss, etc. The teacher of mathematics should know of these unpractical things perhaps, but for the average student, they have little value. The teacher may need to know why we "carry" when we add a row of figures, but the pupil needs to know how to "carry" and to do it without making an error. Our teaching has been entirely too scientific, and must be and is being revolutionized.

Thus we see our methods and aims reverting back somewhat to those of Pestalozzi, where we begin to get down to real, concrete objects and teach arithmetic for its value in

everyday life.

Happily, however, there has been a recent shift in the teaching of arithmetic from the academic point of view to the social and utilitarian end. Surely, this is as it should be. The old "Formal discipline" and scientific aims have slowly but surely given place to the newer and more logical claims of utility and social insight. Until recently, the worth of arithmetic was measured by its value in light of college or university perspective. The scholar formulated the rules by which we went, and conditions far above and outside of actual school life contracted the teaching. Thus, we are forced to come to earth again, and come back once more to the convictions of the old man of Zurich. We simply cannot get away from his idea that arithmetic must be objective and concrete, as well as practical. In spite of this change for the better, however, the best elements of the old formal system have been retained and brought over into the present methods. It retains its scientific qualities in that it is positively accurate; it retains its disciplinary qualities in that it still trains; but the accuracy and training retained are so associated with actual business problems common to every day life, that they lose their former inefficiency.

Teachers everywhere are beginning to realize that something other than a purely utility value is the prime aim of teaching arithmetic. A larger social utilitarianism has been introduced and the modern teacher eagerly takes part in the movement. This fact will doubtless seem paradoxical when we think of the great trend towards vocational training that has come over our country within the last few years, yet it is true that such is the case. Thus, we are doing much to pre-

serve our real elementary school as a place where the child is socialized. The elementary school is a place to train children for all trades and walks of life, and not to train them in a few favorite ill chosen subjects.

Pestalozzi lost no opportunity to instill sympathy and brotherly love in his pupils. Once, when a nearby school had been suddenly burned, and its youthful occupants had been thrown out of a home as a consequence, Pestalozzi took advantage of this incident to appeal to the sympathy of his charges. "Hundreds," said he, "are at this moment wandering about just as you were last year, without a hope, perhaps without food or clothing." He then told them how nice it would be to receive some of these desolate children into their own school and they eagerly agreed to invite them to come, and so they did. Thus he succeeded in teaching them the real values of sacrifice and privations that others might be benefited thereby. The moral and religious life of the children was developed greatly by just this means of pointing out to them the hardships and sufferings of those more unfortunate than themselves. Likewise, we find the socialistic and altruistic spirit developing in our present day schools. It is the duty and purpose of every teacher to bring about just this kind of result that Pestalozzi strove to obtain in his life time. Patience, love, sympathy, and companionship are the ideals which the modern teacher is striving to inculcate in his pupils, and when he has accomplished this end, he has done much towards making his teaching a success.

Again, a great change has recently came into our schools as concern the attitude of the teacher towards the pupil. Pestalozzi, as we have seen, maintained that the recitation

should be conducted in a sympathetic and fatherly manner. The child should be aided as far as possible in obtaining the most to be gotten from the instruction. He was subject to questions from the teacher to be sure, but they were put in such a manner that no fear was created on his part. A short time ago, however, the teachers were accustomed to assume an authoritative attitude over the pupil and thus cause the lesson to become a dread and a bore to the pupil and teacher alike. The teacher asked dry, made-to-order questions just to find out whether or not the child had learned some specific assigned matter from the book, and perhaps if he had worked some certain set of problems. In other words, the teacher "heard the recitation". Nothing can be imagined that is more wasteful than such procedure. Fortunately, the present tendency is to return to the old idea of homelike, sympathetic teaching of Pestalozzi. The teacher of modern times so directs his questions as to instill faith and confidence from the pupils point of view, and by so doing, he gets real results. He leads the pupil on to deeper and higher thought by his skillful questioning. He at all times directs the work, but the pupil suggests what is to be done next. Thus we see good teaching as opposed to poor teaching. Unhappily, this is not true of all our schools, for we have a few teachers yet who are so far behind in educational ideas that they have chosen to cling on to the antiquated method outlined above. This condition prevails in a very limited circle, however.

Another idea used in our present day teaching that may be traced back to Pestalozzi, is that of the non-importance of home work on school subjects. Few books are to be taken home by the young child, and in most cases, none at all.

Since his problems in arithmetic are to be worked out largely by objective methods, it is impossible for him to get a great deal of instruction from home study. Real progress is made in the school room, and there only, for it is the life and personality of the teacher that moulds the pupil's ideas. Very little attention was paid to what the book said in Pestalozzi's teachings. The teacher was the main authority and his word was accepted.

Today, arithmetical applications find a much greater use in teaching than in the time of Pestalozzi and before. A better proportion has been worked out between concrete and abstract problems. Real problems are being substituted for the old and impractical ones.

Again, the recent emphasis placed upon psychology has brought about an immense change in the method of teaching arithmetic. A careful, psychological study of the child has proved that the old, dry method of teaching was extremely wasteful. Psychologists have worked out methods upon a psychological basis; have refused many of the old aims and customs in teaching and have accepted and adopted many founded upon their own investigations.

Now we shall consider a few concrete, specific cases in which the teaching of arithmetic has changed during the last few generations. First, let us consider the teaching of percentage, interest, and all phases of arithmetic dealing with banking. Formerly, it was taught in the old method of numbers, consequently the entire process was more or less mechanical. Now the children are taught these principles from a more practical standpoint. They are carried to the local

banks and are shown by the cashiers and tellers just how the banking and calculating is done. They are taught how to use the cashier's percentage scale by which he quickly and easily determines his interest totals. Notes are discounted before their eyes and consequently made much more impressive for them. Thus they see today in actual operation what the child of a century ago studied of in a vague, abstract way, and with no objective impression made, little result was accomplished. Also, when the child studies measures and weights today, he is taken to a nearby grocery store and sees the merchants use the quart, the pint, and the gallon measure; he sees this same merchant use the scales to weigh objects and sees him apply and balance the scales with the ten lb., the twenty-five lb., and the fifty lb. weights. Thus an impression is made upon him that could never have been made by the old method of class room teaching. Here we see the object method of Pestalozzi carried to advantageous proportions.

We also find that in solving an applied problem, more of the logical element enters into the solution than formerly. A logical explanation is as essential to a proper solution as the final result. For example, a farmer remits $2185. as the proceeds of a sale after taking out 10% comission; how much did the farmer receive from the sale?

Now, .90 of the sum = $2185.

Therefore, the sum = $2185 ÷ .90 = $2428.

Some would say use another method:

90% of the sum = $2185.

1% of the sum = $24.28

Therefore, 100% of the sum = 100 X $24.28 or $2428.

Teachers often allow thier pupils to write loose, careless equations, causing a false impression. We are all acquainted with the old puzzle that a bucket full equals a bucket empty. The "proof": a bucket half full equals a bucket half empty; multiply by one half and a bucket full equals a bucket empty. The child sees this and is confused, and doubts the whole theory of mathematics. The modern, up-to-date teacher trys to keep the child out of all such "mathematical wrinkles". For the child to be allowed to say that 25¢ equals a bag of candy is no worse than to say that twelve hours equal 180°. There must be an equality set forth in each statement. The child sees cents suddenly transformed into candy and is mystified by the transaction. A good teacher avoids just this thing.

The teacher of arithmetic should always have an abundance of illustrative materil in the schoolroom. He should, if possible, provide a special box or cabinet in which these objects might be kept and thus be readily accessible. In the well organized school of today, this condition is true and objects are used just as effectively and truly as in the days of Pestalozzi. But the present day teacher is prone tobe not uniform in his use of objects. That is, in the development of some special idea, he may use objects that have absolutely no connection what ver with one another. This method is likely to cause a disconnected link in the child's progress and should be so grouped that they have a decided relation to one another. They should serve to demonstrate the same arithmetical fact or truth. Another weakness often found in the use of objects is that of the use of these objects indiscirminately. Children use objects in classrooms that they

will never be called upon to use in actual life. Thus they are learning the use of a useless object. This should be guarded against as far as possible.

Thus we have seen and discussed a few of the differences and similarities between our present methods of teaching and those of the eighteenth century. As is invariably the case, the change that we have mentioned has been very gradual. The continuity of the growth of teaching prevents the coming of any great upheaval, but makes it necessary that changes come slowly.

We have seen that the present-day is far less formal than that of the eighteenth and nineteenth centuries. We have also seen that the home and school connection, as it was advocated by Pestalozzi, is being emphasized more and more from year to year and has proved a great advantage over the old, cold, unsympathetic method.

Next, we have seen how the continuation and enlargement of the sense-perception method of teaching arithmetic has caused our teaching methods to take an immense step forward. A continual desire for objective work has augmented the use of objects in arithmetic teaching. Consequently, while many of Pestalozzi's ideas have come to us modified and outgrown, yet we can easily see the stamp of their organization upon them and are forced to realize that to him we owe much that we possess in education

Concerning the teaching of reading, it is interesting to observe how our present method of teaching by the phonetic method had its origin in the practices as set forth by Pestalozzi. The child was taken when quite young, even in his cradle days, and taught the various combinations of sounds and letters. These children were drilled in the

elements of sound, such as da, da, ba, ba, ma, ma, pa, pa, ra, ra, thus equalling, if not excelling, our present day system. They paid little attention to the letters themselves, but laid great emphasis upon the sounds and combinations of letters. Pestalozzi, pioneer that he was, easily saw that it was a criminal waste of time to have the child spend weeks and days learning a few stilled, isolated letters and then when the time came to put them into practice, to be unable to do so. So he maintained that letters should be learned by sound and learned in such combinations as they actually occur in words and sentences. This method soon died out, however, and letters began to be taught by the cold, wasteful, hopeless method of learning the letters themselves. For years and years, students suffered under this disadvantage, but no one came along to change the system of teaching. It has been only within the last few years that this method has been discarded and the more logical and sensible method of phonetic teaching has taken its place.

Pestalozzi held that this early period of the child's life should be gone over very slowly and carefully, for it is then that the foundation is laid, and can easily be laid either correctly or incorrectly. One of his helpers, Buss, says that when he first began his work with Pestalozzi he was disgusted with the way he spent so much time with the elementary training of his children, but when he began to see what excellent results came from this training, he saw that it was the only way and that his own inefficient education had been due to the desultory and incoherent character of that education. The child's attention, love, and imagination are all flexible when young and then is the time to mould them properly