Theory and Practice: An Assembly Program
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Theory and Practice

An Assembly Program

By Irving Adler
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(As the curtain rises, a girl is talking with much animation. Her companion, a boy, is the picture of skepticism.)

Girl: And that's my plan. What do you think of it?

Boy: There's nothing in it. It sounds alright in theory, but it won't work out in practice.

Voice: (Coming from nowhere, everywhere, filling the room): Hold on there! That doesn't make sense!

(Boy and girl look around, surprised, bewildered.)

Boy: Wh-who are you?

Voice: Who am I? People who think straight and talk sense have no trouble recognizing me. But you just spoke some nonsense.

Boy: (Belligerently) Whaddaya mean! All I said was that her plan may be good in theory, but it won't work out in practice!

Voice: Precisely. You consider yourself very practical, don't you?

Boy: Sure! I don't go in for any theoretical stuff. I say experience is the best teacher.

Girl: You can learn from books, too!

Boy: Huh! There she is with books again. Look. I learnt how to drive a car and I didn't learn it from a book, either. (Aggressively, advancing on girl, pointing finger into her face as she retreats.) Did you learn to drive a car from a book? No! Did anybody ever learn to drive a car from a book? No! See! What did I tell ya!

Voice: We'll give you a chance to show how practical you really are. Bring up that board that you see in the corner.

Boy: Hey, this looks like a pin-ball machine.

Girl: And here's a box of marbles. I see. You drop the marbles in at the top, and they collect in these chambers at the bottom.

Boy: Yeah. I can see that, too. But what's it got to do with me?

Voice: There are 64 marbles in that box. If you drop them all in, one at a time, how many will collect in each chamber?

Boy: Aw, that's easy. Just count the chambers. One-two-three-four-five-six-seven. I'd say—let's see now—seven into sixty-four—that's about nine in each. See! Here, I'll show ya! (He starts dropping the marbles in. The girl interrupts.)

Girl: Wait! I've been thinking—

Boy: (With disgust) What, again! Come on, let's not waste any time.

Girl: I have it. You're all wrong. The distribution depends on chance and therefore won't be the same every time. But the approximate distribution will probably be one in the first chamber, six in the second chamber, then 15, 20, 15, 6 and 1. (Writes on the board as she speaks.)

Boy: You and your crazy ideas! (Resumes the dropping of the marbles until all 64 are in the chambers.)

Voice: Now count the marbles in each chamber. (The boy counts and calls out the figures while the girl writes them on the board.)

Voice: I'm afraid, my boy, that you're not as practical as you think. Your answer was all wrong. Your see, there are very few in the end chambers and many in the middle chambers, as predicted by your friend.

Boy: Well, it's not my fault. I never did this before. How can you know what will happen if you never had the experience?

Voice: Perhaps your friend can answer

that since her numbers gave a better result. Tell us, Miss, how did you know what to expect?

GIRL: Oh, I had a theory. I'll explain it to you. (Draws a diagram at the board.) This is what the board looks like. After a marble comes through the first opening, which way can it move?

BOY: Well, it can go to the left or to the right.

GIRL: That's right. If it goes to the left it comes through this opening. If it goes to the right it comes through that one. Since both paths are equally likely, then, out of every two marbles, one will probably go left and one will go right. Now, a marble can reach this opening (points to first space on third line) only if it comes from here. (Points to first space on second line.) How can a marble reach the second space?

BOY: (Pointing) From here moving right or from there moving left.

GIRL: That makes two paths leading to the center space. And only one path leading to the third space. Now, every marble coming through the third line must move left or right, left or right, left or right. (Draws lines as she speaks). How many paths lead to this space?

BOY: Only one.

GIRL: To this space?

BOY: Three. One from here, and two from there.

GIRL: This space?

BOY: Three again. And the last is one.

GIRL: Do you think you can figure out the number of paths to the openings on the next line?

BOY: I think I see it. Each marble goes left or right. So one can come here. One and three is four. Three and three is six. Here's another four. And one.

GIRL: Now get the next two lines.

BOY: (Continues the computation out loud. After reading the final figures.) That's what you said before. Well, whaddaya know!

VOICE: That brings us back to the statement I objected to before. Do you remember what you said?

BOY: Yes. I said her plan was alright in theory but wouldn't work out in practice.

VOICE: After your experience with the pin-ball machine, can you see what was wrong with the statement?

BOY: Well, I suppose I didn't see how useful a good theory can be.

GIRL: That's right. By using my theory, I was able to figure out approximately what would happen.

VOICE: Precisely. A good theory gives you understanding. And understanding is essential for intelligent practice.

BOY: Does that mean that all theories are good?

VOICE: No. A good theory must be based on practice. An idea that has no foundation in experience will not bear any practical fruit. If a theory doesn't work out in practice then it's no good as a theory.

GIRL: Do you see what he means? Theory and practice cannot be separated. We need them both.

BOY: I get the point. I can see how it worked out with the pin-ball machine. But that's only a toy. Are there really cases where important practical things are based on a theory?

VOICE: Are there? Just listen.

(Two voices alternate using contrasting tones and tempos. As each theory is mentioned, a girl emerges from the left carrying an appropriate poster. At the mention of each practical achievement, a boy enters from the right.)

VOICES: Mathematicians, playing with theoretical lines on theoretical spheres, developed spherical trigonometry.

By using spherical trigonometry, the captain of a ship at sea can find his position within two miles.

Clerk Maxwell, physicist, predicted from his equations that energy could be broadcast as electromagnetic waves.

Today the powerful radio industry stands as a monument to the correctness of the Maxwell theory.

Albert Einstein obtained as a consequence of his theory of relativity the mass-energy equivalence equation, E equals MC-square.

Today the ruins of Hiroshima and Nagasaki are grim reminders that yesterday's theory is the foundation for today's practice.

BOY: I think I understand. And I know who you are, too.

VOICE: Who am I?

BOY: You are the voice of Science.

CURTAIN

Posters:

1. Maxwell equations.
2. Diagram of a radio circuit.
3. Spherical Trigonometry diagram and the Cosine Law.

Diagram that is placed on the board:

$$\dot{1} \quad \dot{1}$$
$$\dot{1} \quad \dot{2} \quad \dot{1}$$
$$\dot{1} \quad \dot{3} \quad \dot{3} \quad \dot{1}$$
$$\dot{1} \quad \dot{4} \quad \dot{6} \quad \dot{4} \quad \dot{1}$$
$$\dot{1} \quad \dot{5} \quad 1\dot{0} \quad 1\dot{0} \quad \dot{5} \quad \dot{1}$$
$$.\ \dot{1}\ .\ \dot{6}\ .\ 1\dot{5}\ .\ 2\dot{0}\ .\ 1\dot{5}\ .\ \dot{6}\ .\ \dot{1}\ .$$

4. A ship at sea.
5. Montage of diagrams showing the bending of light, the relativity precession of an electron orbit, and the equation E equals MC-square.
6. Sketch of a bomb, labeled ATOMIC BOMB.

Notice to Members

ANY ONE who began his subscription to THE MATHEMATICS TEACHER with the October issue in 1947 is automatically a member of the National Council of Teachers of Mathematics until October, 1948. However, since no issues of the magazine are published in June, July, August and September, those who paid their dues in October of last year should send in their renewals before October, 1948 in order to save the Council inconvenience and loss of money. Costs of publication are rising and in order not to have to raise the price of the journal any further (the present dues are $3) we bespeak the cooperation of our members in being prompt in making renewals. In order to make sure that this matter was not overlooked by subscribers, THE MATHEMATICS TEACHER sent out cards to all members whose subscriptions expire in May (even though their membership runs to October). It has been almost impossible to plan for the October issue each year because members are so careless about renewing in time. Moreover, entirely too many members fail to renew at all even though two or three notices and a personal appeal from the Editor have been sent out. It is more important now than even before to "stick by the ship" if we are to weather the storms ahead and if the Council is to continue to do its work effectively. This year in particular we cannot afford to send the October issue to those whose dues have not been previously paid.
—EDITOR

Increase in Price of Yearbooks

The National Council is compelled to increase the price of the 15th and 16th and 18th yearbooks to $3 each, postpaid, effective September 1, 1948. The 19th and 20th yearbooks are also $3 each postpaid. We are sorry to have to increase our prices, but we hope that our members will all secure increases in salary for the coming year, so that our increases will not be burdensome. In the days ahead it is extremely important for every teacher of mathematics in the elementary and secondary schools to show his allegiance to The National Council by keeping up his membership in that organization. We know you will not fail us.—EDITOR