# Principles
# of
# Programmed
# Learning

## by
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1. Learning should be fun.  However, in the early stages of learning a subject,  students often make many errors.  Most people (do / do not) like to make errors.

do not

2. When a student makes many errors in learning, he often decides that he does not like the subject.  He would be more correct to decide that he does not like to make _____.

errors

3. For a long time, educators, psychologists, and people in general thought it was impossible to learn without making a large number of *errors*.  In fact, they even had a name for this kind of learning.  They called it "trial-and-_____" learning.

error

4. Recent developments in the psychology of learning have cast serious doubts as to the necessity of "trial-and-error" learning.  If the learning material is carefully prepared, or PROGRAMMED,  in a special way, the student can master the subject while making very few errors.  The material you are reading right now has been prepared, or _____ in this special way.

programmed

5. The basic idea of programmed learning is that the most efficient, pleasant, and permanent learning takes place when the student proceeds through a programmed course by a large number of small, easy-to-take steps.  If each step the student takes is small, she (is / is not) likely to make errors.

is not

6.  A *programmed course* is made up of many small, easy-to-take steps.  A student can proceed from knowing very little about a subject to mastery of the subject by going through a _____ _____.  If the programmed course is carefully prepared, the student should make (many / few) errors along the way.

programmed course,  few

7.  Programmed learning has many features which are different from conventional methods of learning.  You have already learned one of these principles.  This principle is that a student learns best if he proceeds by small _____.

steps

8.  The features of programmed learning are applications of *learning principles* discovered in psychological laboratories.  You have learned the first of these principles.  You can guess that we call it the Principle of Small _____.

Steps

9.  The principles on which programmed learning is based were discovered in (psychological / astrological) laboratories.  The first of these principles is the Principle of Small Steps.

psychological

10.  The first Principle of Programmed Learning is <u>The Principle of</u> _____ _____.

Small Steps

11. What is the first Principle of Programmed Learning?

_____ _____ ___ _____ _____

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The Principle of Small Steps

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12. Another finding from psychological laboratories is that the student best learns if she is actively responding as she is learning. The student who actually works out algebra problems will probably do (better / worse) on a test than the student who only reads the explanations and looks at the example.

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better

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13. Another way to say that people "learn by doing" is to say that they learn by *active responding*. You can guess that the second Principle of Programmed Learning is the Principle of Active _____.

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Responding

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14. Principles of Programmed Learning:
    1. The Principle of Small Steps
    2. The Principle of Active _____.

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Responding

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15. Principles of Programmed Learning:
    1. The Principle of _____ _____.
    2. The Principle of _____ _____.

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1. Small Steps
2. Active Responding

1.
2.

16. Principles of Programmed Learning:

　　1. ___ _____ ___ _____ _____

　　2. ___ _____ ___ _____ _____

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1. The Principle of Small Steps
2. The Principle of Active Responding

1.

2.

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17. A third principle from the psychological laboratory: Students learn best when they can *confirm* their answers immediately.  A student who must wait two weeks for test results probably (will / will not) learn as well as a student whose test is scored immediately.

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will not

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18. Third Principle:  A student learns best when she can *confirm* her answers immediately.  This can be called the Principle of Immediate Confirmation.  In the programmed course you are now using, you can confirm your answer immediately.  So this programmed course (does / does not) use the Principle of Immediate _____.

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does,  Confirmation

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19. When a student can *immediately confirm* his answer, the Principle of _____ _____ is being applied.

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Immediate Confirmation

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20. Three learning principles:

　　1. The Principle of Small _____

　　2. The Principle of Active _____

　　3. The Principle of Immediate _____

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1. Steps    2. Responding   3. Confirmation

1.　　　　　　2.　　　　　　3.

21. Three learning principles:
    1. The Principle of _____ _____
    2. The Principle of _____ _____
    3. The Principle of _____ _____

| | |
|---|---|
| 1. Small Steps | 1. |
| 2. Active Responding | 2. |
| 3. Immediate Confirmation | 3. |

22. When a subject matter, such as calculus, is broken down into parts so that the student can easily go from one item to the next, we are using the Principle of _____ _____.

| | |
|---|---|
| Small Steps | |

23. When the material from which the student is learning demands that he write his answer out, the Principle of _____ _____ is being used.

| | |
|---|---|
| Active Responding | |

24. When the learning material is arranged so that the student can find out immediately if her answer is correct or incorrect, the Principle of _____ _____ is being used.

| | |
|---|---|
| Immediate Confirmation | |

25. Some people naturally learn more rapidly or more slowly than others. If the pace of a classroom is too fast or too slow for a student, he probably (will / will not) learn as well as he could at his own pace.

| | |
|---|---|
| will not | |

26. In programmed learning, each student can work each step as slowly or as quickly as she chooses. This is called the Principle of Self-Pacing. Since you can spend as much or as little time as you wish on each step in this course, the Principle of Self-Pacing (is / is not) being used.

is

27. The Principle of Programmed Leaning which allows a student to *pace* himself is called the Principle of _____ - _____.

Self-Pacing

28. When each student is allowed to learn at her own rate (as with a private tutor), the Principle of _____-_____ is being used.

Self-Pacing

29. You have now learned four of the five most important principles of programmed learning. Now we will review them.
    1) Principle of _____ _____ (easy sequence of steps)
    2) Principle of _____ _____ (student makes a definite response)
    3) Principle of _____ _____ (student learns immediately if she is
                                                        right or wrong)
    4) Principle of _____-_____ (student can choose his speed)

1) Small Steps            1.
2) Active Responding      2.
3) Immediate Confirmation 3.
4) Self-Pacing            4.

30. In programmed learning, the student makes a complete record of his learning experience. If he writes down his answer to each step, it (is / is not) possible to find out exactly where he made mistakes.

is

31. Suppose a student goes through 100 steps in a programmed course and writes down each answer. She makes four mistakes. From her record, you (can / cannot) tell where each mistake was made.

can

32. Assume you want to improve a programmed course by revising it. Suppose 10 students all made a mistake on step number 37. This probably (would / would not) be a good frame to revise.

would

33. Students miss steps because they are too big, unclear, or have not been reviewed often enough. By looking over a programmed course, you (can / cannot) see exactly what steps came before a step on which a mistake was made.

can

34. Since accurate records of the learning experience of each student are available, revisions can be made on the basis of actual student responses. If the presentation of some point is not clear, this (will / will not) show up in the student's performance on the programmed course.

will

35. Revision of a programmed course on the basis of student performance is called the Principle of Program Testing.  Since the course you are taking now has been developed on this basis, the Principle of _____ _____ has been used here.

Program Testing

36. Making revisions of programmed courses on the basis of the learning records of students is making use of the fifth Programming Principle.
_____ _____ ___ _____ _____

The Principle of Program Testing

37. You have now learned five important programming principles.  Now we will review them.
1) Principle of _____ _____ (easy progress from item to item)
2) Principle of _____ _____ (student actively records his response)
3) Principle of _____ _____ (rapid knowledge of correctness)
4) Principle of _____-_____ (student chooses speed of progress)
5) Principle of _____ _____ (program revised on basis of student performance)

1)  Small Steps
2)  Active Responding
3)  Immediate Confirmation
4)  Self-Pacing
5)  Program Testing

1.
2.
3.
4.
5.

38. Now see if you can list five programming principles without hints.

1)

2)

3)

4)

5)

| | |
|---|---|
| 1) Principle of Small Steps | 1. |
| 2) Principle of Active Responding | 2. |
| 3) Principle of Immediate Confirmation | 3. |
| 4) Principle of Self-Pacing | 4. |
| 5) Principle of Program Testing | 5. |

39. A student "gives up" on an algebra lesson from her textbook because the steps in the first problem are much too big. What programming principle was not followed here?

The Principle of Small Steps

40. A student takes an examination. The teacher, by working late each night, gets the papers graded in one week and returns them to the class. The student has since lost interest and doesn't check his paper. What programming principle has not been followed?

The Principle of Immediate Confirmation

41. A student goes through a programmed course writing down her response to every step. What programming principle is being followed here?

The Principle of Active Responding

42. A programmer finds that on the first draft of a programmed course, students made more than 50% errors. He completely revises the course. In the new version, students make only 4% errors. What programming principle has been used here?

The Principle of Program Testing

43. A very bright student becomes bored because she already knows the material being taught. As a result she daydreams and gets into trouble with her teacher. What programming principle has not been followed here?

The Principle of Self-Pacing

44. A student is convinced by previous experience that he cannot learn algebra. He happens to try a programmed course in algebra. To his surprise, he finds that each of the first 75 steps he tries are easy to understand and he has no difficulty. What programming principle is being used here?

The Principle of Small Steps

45. A good teacher is disturbed because students are not "getting" the material. They say they don't understand her lectures or the textbook. Unfortunately, she has no specific record of what goes wrong, so she has difficulty in revising and improving her presentation. What programming principle is not being followed here?

The Principle of Program Testing

46. A student is studying chemical equations. He thinks he "understands," but *never actually practices writing out any equations*. He takes a test on chemical equations and gets a very low score. What programming principle is not being followed here?

The Principle of Active Responding

47. A student is learning physics from a programmed course. She is not absolutely sure of every answer, but she can check each answer within a second after she writes it. What programming principle is being followed here?

The Principle of Immediate Confirmation

48. A very careful student is learning electronics from a programmed course. It takes him twice as long to finish as it takes the rest of the class. However, on the final test, he does as well as anyone. What programming principle is being followed here?

The Principle of Self-Pacing

49. It is easy to remember the five Principles of Programmed Learning. To do this, just remember what happens as you go through a programmed course. The first thing you do is READ the material in a step. This material has been carefully constructed so that you can take that step *easily*. Therefore, the Principle of _____ _____ is used.

Small Steps

50. READ ⟶ WRITE
After you *read* the *Small Step* material, you WRITE your answer. Since writing is an active response, you are using the Principle of _____ _____.

Active Responding

51.    READ ⟶ WRITE ⟶ CHECK

1) *Read Small Step* material
2) *Write* your answer.
Next, you CHECK your answer immediately.  Since you can find out immediately if your answer is correct, you are using the Principle of _____ _____.

Immediate Confirmation

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52.    READ ⟶ WRITE ⟶ CHECK ⟶ ADVANCE

After reading, writing, and checking your answer, you ADVANCE to the next step as slowly or as quickly as you wish.  Since you can advance at your own rate, you are using the Principle of _____ - _____.

Self - Pacing

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53.    To remember the first four Principles of Programmed Learning, just remember what happens when you work through a programmed course.

[READ] ⟶ WRITE ⟶ CHECK ⟶ ADVANCE

1)  READ:  This reminds you that you first read the specially-constructed material in each step.  So the first programming principle is the Principle of _____ _____.

Small Steps

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54.    READ ⟶ [WRITE] ⟶ CHECK ⟶ ADVANCE

2)  WRITE:  Responding to each step by writing reminds you of the Principle of _____ _____.

Active Responding

55. READ ⟶ WRITE ⟶ [CHECK] ⟶ ADVANCE

3) CHECK: Being able to check each answer right away reminds you of the Principle of _____

Immediate Confirmation

56. READ ⟶ WRITE ⟶ CHECK ⟶ [ADVANCE]

4) ADVANCE: Being able to take each step at your own rate reminds you of the Principle of _____-_____.

Self-Pacing

57. READ ⟶ WRITE ⟶ CHECK ⟶ ADVANCE

Remember the order of events as you go through a programmed course. These will help you remember the first four principles of programming. Now, review.
1) Principle of _____ _____.
2) Principle of _____ _____.
3) Principle of _____ _____.
4) Principle of _____-_____.

| | |
|---|---|
| 1) Small Steps | 1. |
| 2) Active Responding | 2. |
| 3) Immediate Confirmation | 3. |
| 4) Self-Pacing | 4. |

58. To remember the fifth and most important Principle of Programmed Learning, remember this word: RECORD. This will remind you that the detailed *record* which the student makes provides the basis for revising the programmed course. This reminds you of the Principle of _____ _____.

Program Testing

59. READ → WRITE → CHECK → ADVANCE → and RECORD

By remembering these five key words, you can easily remember the five important features of programmed learning.

1) Principle of _____ _____.
2) Principle of _____ _____.
3) Principle of _____ _____.
4) Principle of _____-_____.
5) Principle of _____ _____.

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| 1) Small Steps | 1. |
| 2) Active Responding | 2. |
| 3) Immediate Confirmation | 3. |
| 4) Self-Pacing | 4. |
| 5) Program Testing | 5. |

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60. You have now learned the fundamental Principles of Programmed Learning. The programmed course from which you learned was developed on these principles. These principles, developed in psychological learning laboratories, are being applied with much success to topics such as mathematics, science, language, and literature.

GO TO NEXT FRAME

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61. Many people feel that the application of these principles will cause a fundamental change in our educational techniques. As was pointed out, we feel the most important aspect of Programmed Learning is the *record* which the student makes of his learning experience. By revising our programmed courses on the basis of these records, we can construct courses which teach better and more efficiently.

GO TO NEXT FRAME

62. But the most important thing about Programmed Learning is this: The records made by a student who has taken a programmed course give us a powerful tool for *learning about learning*. It has been characteristic of science that great strides forward are made when powerful new observing instruments are developed.

GO TO NEXT FRAME

63. Witness the advance in astronomy following the invention of the telescope, and in biology and medicine following the invention of the microscope. We feel that the step-by-step record which programmed courses provide may prove to be an equally powerful tool in studying the most complex scientific phenomenon, human learning.

END OF PROGRAM