INTRODUCTORY.

An introductory course in experimental psychology serves two chief ends: it affords a training in the peculiar technique and methods of psychological experiment, and it illustrates the scope of experimental study in psychology. The actual results obtained from a class experiment, though they can hardly fail to be of interest, can but rarely be regarded as justifying sweeping conclusions. Accordingly from the beginning the student should concentrate his attention upon the methods which he is instructed to employ, and upon getting as clear a conception as possible of the nature and range of experiment in psychology. Frequently a careful and critical student, dissatisfied with his results, may be inclined to consider the experimental method unsuitable to the field of psychological investigation. It is certain that in no psychological test can the ideal experiment, in which all of the conditions are thoroughly under control, be performed. It is equally certain that we can never be quite sure that only one condition is being varied. But such facts do not affect the desirability that psychological observation and analysis should be carried out under conditions which have been rendered as definite as possible. It must from the outset be realised that as we can obtain only partial control and partial independent variation of conditions in psychological experiment, all experimental study must at present be supplemented by most careful attention to facts of general psychological observation and to results of general psychological analysis. The experimentalist in psychology must be a psychologist; otherwise the tendency will be towards the mere accumulation of numbers of facts which show very little coherence, and appear to lead nowhere in particular.

The present course is divided into four sections. The first three of these comprise thirty-two lessons and may be taken to represent a first year's work in experimental psychology. The first section is designed to give a training in the technique of psychological experiment, and is itself divided into two
 EXPERIMENTAL PSYCHOLOGY

parts. The first six lessons deal with typical experiments the results of which require qualitative analysis, the second five with experiments treated by quantitative methods, while three lessons involving other special points of technique are added. In the second section a number of experiments directed to a study of the special senses are collected. It is assumed that certain of the commoner experiments on sensory processes will be demonstrated in lectures which accompany this course. Accordingly the experiments which are to be performed in the practical class work, are those which by their nature are less suitable for general demonstration. But they must not be regarded as covering more than a part of the ground, and their results must be considered in conjunction with those of the demonstrations and with those of the additional experiments on sensory processes included in Section IV. In the third section a number of typical experiments on perception and the higher mental processes are collected. These again represent but a small selection from among the possible tests.

It is assumed that in general each student will work throughout the whole course in conjunction with a second student with whom he will act alternatively as experimenter and subject. The student who is going to act as experimenter will be expected to read beforehand the description of the experiments which he is to perform in any given practical class, and if necessary to prepare material for the experiment. An account of the course of each experiment, an analysis of the results, and the record of the subject's introspections must be written out as soon as the experiment in question has been completed, so that at the end of his course every student will have a complete note book of a practical class course in psychology, including the description of the experiments, the record of how they were conducted, the analysis of their results, and the introspective accounts of the experiences of the subject.

The general plan according to which each experiment will be written out by the student will be as follows:

1. General description of experiment.

2. Names of experimenter and subject.

1 Some of these will be found included in Section IV.
INTRODUCTORY

3. Date and time of experiment, together with notes upon any remarks the subject may have to make about his mental condition at the time of the experiment, and notes upon any unusual feature of the external environment. The writing of these notes must be taken seriously. One of the main points of the course is to promote habits of psychological observation, and it is important from the beginning to get into the way of noting carefully everything that may appear to have any bearing upon the results.

4. Brief account of the course of the experiment, with particular reference to any modifications of the general procedure which may prove to be necessary.

5. The results of the experiment as observed by the experimenter.

6. The results of the experiment as observed by the subject expressed in terms of his own experience.

7. Summary of conclusions that may seem probable, and suggestions for improvement or development of the method of the experiment.
SECTION I.

THE TECHNIQUE OF PSYCHOLOGICAL EXPERIMENT.

A. QUALITATIVE ANALYSIS OF EXPERIMENTAL RESULTS.

The first five lessons in the course are intended to provide practice for the subject in introspection, for the experimenter mainly in the giving of directions for experiment. The experiments should in general be carried out in three stages. First the experimenter will give to the subject his instructions. These must be made definite and unambiguous, and at the same time the aim of the experimenter will be to set the subject as completely at his ease as possible. In the subsequent experiment, the experimenter must keep a careful watch upon any specific influence of the instructions upon the results. One of the problems of this course for the experimenter is to determine in general the effect of “awareness of a task” upon experimental results.

In the second stage both experimenter and subject should concentrate their attention upon the actual performance of the task set.

In the third stage, the subject, either by dictation or writing, will give his introspective account of the course of the experiment. This will then be of the nature of immediate retrospection.

Occasionally attempt should be made to mingle stages two and three, so as to determine what are the main effects of the effort simultaneously to perform a task and to introspect its performance.

Experiment I.

FREE ASSOCIATION.

*Materials required:* Lists of words\(^1\); stop-watch; pen and paper.

\(^1\) Any list of about 100 words prepared by the experimenter will serve the purposes of this experiment. Suitable printed lists may be obtained from practically any firm which supplies psychological apparatus.
FREE ASSOCIATION. EXP. I

The experimenter will obtain a list of words, and a stop-watch. The instructions to the subject are:

“I am going to read out to you a word. You are to listen and then to tell me the very first word that occurs to you after you have heard the word that I give you. Make no effort to get any particular kind of word, but give me at once any word that ‘comes up,’ as we say. I will give you five practice trials, and then we will begin the experiment proper.”

The word pronounced by the experimenter is called the ‘stimulus word,’ that returned by the subject is called the ‘reaction,’ or ‘response word.’ The experimenter starts his stop-watch as he gives the stimulus word, and stops the watch as the subject gives the reaction word. The experimenter writes each reaction-word opposite its stimulus word, and records the time of the reaction.

When the list has been completed the subject should work carefully over the whole and try to say how he arrived at each reaction word, and in what form (e.g., with or without visual imagery) each response occurred to him. The experimenter and the subject together should try to answer the question ‘How far are the associations really ‘free’? ’ i.e., is there not in every case some type (or types) of association to which a given subject is predisposed? Particularly note all the instances in which the time of the response as indicated by the stop watch is unusually prolonged. The subject should attempt to account for this delay. At the conclusion of the whole experiment the class should compare associations given by different subjects for the same list, and should discuss likenesses and differences. All the students should use these results to help them to answer the questions: “What is the significance for psychology of individual differences? How far do such differences render general conclusions in psychology hazardous?” At the conclusion of the experiment an attempt should be made to classify the associations given. A scheme of classification is suggested in Part I, p. 142. Attention should be paid to the relative frequencies of the different types of association.
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Experiment 2.

CONSTRAINED ASSOCIATION.

Materials required: Lists of words¹; stop-watch; pens and paper.

The experimenter will obtain from the demonstrator lists of words and a stop-watch.

(a) Opposites test.

The instructions to the subject are:

“I am going to read you a word. You are to listen, and then to tell me as quickly as possible the word whose significance you consider to be exactly opposite to that of the word given to you. You understand: you are to give me the word whose meaning is precisely the opposite to the meaning of the word which I shall give you. You will have three practice trials, and then the experiment proper will begin.”

Results are to be recorded, analysed, and compared precisely as in the case of the ‘free’ association experiment.

(b) Part-whole test.

The instructions are:

“I am going to read you a word. You are to listen, and then to tell me as quickly as possible the name of the whole of which the given word names a part. You understand: I shall give you the name of a part of something, and you will give me the name of the whole of which it is a part. You will have three practice trials and then the experiment proper will begin.”

Results are to be recorded, analysed and compared precisely as in the case of the ‘free’ association experiment.

(c) Species-genus test.

The instructions are:

“I am going to read you a word. You are to listen, and then to tell me the name of the genus of which the given word names a species. You understand: I shall give you the name of a species, and you will give me the name of the genus of which

¹ See note on p. 4.
CONSTRANDED ASSOCIATION. EXP. 2

it is a species. You will have three practice trials, and then the experiment proper will begin.”

Results are to be recorded, analysed and compared precisely as in the case of the ‘free’ association experiment.

\[(d) \text{ Mixed relations test,}\]

The list of words must be handed, face downwards, to the subject.

The instructions are:

“On this form are a number of words so arranged that three words appear on each line. The first two words on each line are related in a certain manner. You have to find a word related to the third word in the very same manner as the second is related to the first word, and to work in this way through the whole list, taking each line as you come to it. For example, you may see [write on paper for the subject to read]:

\[\text{gold: yellow: blood:}\]

and you would write for the fourth word \textit{red}, since \textit{red} is the colour of blood as \textit{yellow} is the colour of \textit{gold}. You will first be given three practice trials”—to be given on a separate form—“and then the experiment proper will begin.”

Record the total time taken by the subject to deal with his form, analyse and compare results as in the case of the experiment on ‘free’ association.

Throughout the whole of these experiments the subject should make a special attempt to state how far and in what way he was aware of the relations involved.

At the conclusion of the experiment the class should attempt to formulate definitely the chief differences observed between ‘free’ and ‘constrained’ association.

\section*{Experiment 3.}

\textbf{PERCEPTION AND REPRODUCTION OF FORMS OF GROWING COMPLEXITY.}

\textit{Materials required:} Set of diagrams or forms of growing complexity of structure. If possible a tachistoscope for their exposure—but this is not essential. Pen and paper.
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The experimenter must prepare beforehand a number of designs which he will arrange in groups according to their complexity of structure. The type of design and arrangement needed for this experiment may be illustrated as below; in regard to detail there may of course be variations from case to case. The designs are to be presented with momentary exposure, one at a time, starting with those of the simplest group, and proceeding to the more complex ones.

GROUP I. Simple designs and patterns not of necessity having any obvious significance, such as:

GROUP II. Designs containing somewhat more detail; some of them likely to suggest representations of concrete objects, and some more meaningless; such as:

GROUP III. Designs which still form readily appreciable wholes, being built according to some appreciable plan, but containing yet more detail; such as:
PERCEPTION. EXP. 3

GROUP IV. Designs which form a group by themselves, passing by simple addition of parts from a simple to a complicated form, such as:

GROUP V. Fairly simple picture material of a concrete kind, of the type, for example, of:
GROUP VI. Any complex picture material, such as illustrations from a newspaper or magazine.

The above types of material must all be prepared before the class meets, and should be of about ordinary postcard size, and clearly drawn. If possible, exposure should be made by a tachistoscopic method (see Part I, p. 322; this Part, pp. 64, 65); but if this is not possible exposure may be made by laying a card on the table with its face covered, and then uncovering it for a period of five seconds.

The instructions to the subject are:

"I am going to allow you to see a drawing or design for a very short period. I shall say 'Now' and then immediately uncover the drawing. Try to notice all of its details and, when I have covered up the design, to reproduce what you have seen."

The subject must attempt to report his method of observation in each case. This must be insisted upon, as the main purpose of the experiment at this stage is to provide practice in introspection directed upon the nature of perceptual process.

The further questions involved are: "What are the factors which enter into the perception of objects of the type here employed?"

"Is there any ground for believing that those factors increase in complexity as the objects themselves become structurally more complex?" (Consider, in reference to this question, what marks the psychologically 'simple'.)