

## How to use Gagne's model of instructional design in teaching psychomotor skills

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### ABSTRACT

Gagne's model of instructional design is based on the information processing model of the mental events that occur when adults are presented with various stimuli and focuses on the learning outcomes and how to arrange specific instructional events to achieve those outcomes. Applying Gagne's nine-step model is an excellent way to ensure an effective and systematic learning program as it gives structure to the lesson plans and a holistic view to the teaching. In this paper, we have chosen a routine practical procedure that junior doctors need to learn: insertion of a peritoneal (ascitic) drain and we use Gagne's "events of instruction" to design a lesson plan for this subject.

**Keywords:** Gagne's model, Information processing model, Instructional design, Teaching.

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### Introduction

Instructional events refer to actions of both teacher and learners during the teaching session. Selecting appropriate events and planning them in the right format and the right sequence is crucial in a successful lesson design. A lesson design is a plan showing the type of instructional events, their order and the kind of activity taking place in each event. In designing a lesson plan, there are 2 important factors: the objectives and the learners.

In this paper, we have chosen a routine practical procedure that junior doctors need to learn: insertion of a peritoneal (ascitic) drain. We use Gagne's "events of instruction" to design a lesson plan for this subject.

### Gagne's model of instructional design

Robert Gagne is considered to be one of the foremost contributors to the systematic approach to instructional design and his theory has provided a great number of valuable ideas for trainers and teachers. Gagne's model of instructional design is based on the information processing model of the mental events that occur when adults are presented with various stimuli and focuses on the learning outcomes and how to arrange specific instructional events to achieve those outcomes. Gagne's theories have been applied to the design of instruction in several domains, such as the military, flying, leadership, engineering and healthcare.

Essential to Gagne's ideas of instruction are what he calls "conditions of learning": internal conditions deal with what the learner knows prior to the instruction, external conditions deal with the

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stimuli that are presented to the learner, e.g. instructions provided by the teacher.

The first step in Gagne's theory is specifying the kind of outcomes to be achieved. He categorised these outcomes into five types: verbal information, intellectual skills, cognitive strategies, attitudes, and motor skills.

The second step is to organise appropriate instructional events. Gagne's "Events of Instruction" consist of the following:

1. Gaining attention
2. Informing the learner of the objective
3. Stimulating recall of prerequisite learning
4. Presenting the stimulus material
5. Providing learning guidance
6. Eliciting the performance
7. Providing feedback
8. Assessing the performance
9. Enhancing retention and transfer

Inserting a peritoneal drain is a motor skill, which corresponds to affective and psychomotor skill outcomes. The ideal number of learners for this kind of session is 4 or 5. The following instructional events can be organised for a lesson to teach insertion of a peritoneal drain:

### (I) Gaining attention

When students arrive at class, their attention can be directed toward many other things, so in order for any learning to take place, first their attention must be captured and their interest should be aroused. Here are some examples:

- 1) An abrupt stimulus change, such as gesturing or speaking loudly
- 2) Starting the lesson with a thought-provoking question or interesting fact.
- 3) Providing an interesting visual or sound stimulus. Depending on the audience, multimedia (like PowerPoint slides) can be used to combine photographs, pictures, and sound.

In our session, combining items 2 and 3 is a good starting point: a case scenario of a patient

with ascites can be presented together with relevant investigations/images, asking the learners about the case. There is no doubt that curiosity motivates students to learn.

### (II) Informing the learner of the objective

Early in each lesson students should encounter a list of learning objectives. This initiates the internal process of expectancy and helps motivate the learner to complete the lesson.

A direct statement can be used in our session: "upon completing this lesson you will be able to":

- Consent the patient for insertion of a peritoneal drain
- Identify the correct anatomical point
- Identify the equipment required
- Prepare, position and monitor the patient
- Understand and perform the correct technique for insertion of a peritoneal drain under fully aseptic condition
- Understand the principles of securing, dressing and connecting the drain
- Understand the importance of appropriate analgesia post procedure
- Complete the appropriate documentation in patient's medical notes

### (III) Stimulating recall of prerequisite learning

Associating new information with prior knowledge and personal experience and getting the learners to think about what they already know can facilitate the learning process.

In our session, 20-30 minutes should be allocated for interactive discussion of the following:

Asking questions about previous observations and experiences, indications of inserting a peritoneal drain, relevant anatomy, findings on examination and relevant tests before the

procedure to confirm the diagnosis (e.g. abdominal ultrasound)

#### (IV) Presenting the stimulus material

This event is where the new content is actually presented to the learner. Content should be organised meaningfully, and explained and demonstrated using a variety of media.

In our session, different steps of the procedure should be explained:

How to consent the patient, monitoring, equipment needed, positioning the patient, the technique of peritoneal drain insertion and how to secure the drain. Finally, tests needed after the procedure (biochemistry, cytology and microbiology tests on the fluid sample), and appropriate analgesia should be explained.

#### (V) Providing learning guidance

This event means showing what appropriate actions constitute correct performance, plus additional suggestions, including use of examples, case studies, graphical representations, and mnemonics to help learners encode information for long-term storage, or in simple terms, "make the stimulus as meaningful as possible".

As this is a practical procedure, if learners first observe the procedure they are in a better position to perform it themselves. The teacher shows the equipment and performs the procedure on a dummy, including the sterile technique, explaining it step by step. While performing the procedure, useful tips and hints can be provided.

#### (VI) Eliciting the performance (practice)

The action now turns to learners. In this event, the learner is required to practice the new skill or behaviour. Eliciting performance provides an opportunity for learners to confirm their correct

understanding, and the repetition further increases the likelihood of retention.

In our session, each one of the learners should get familiar with the equipment, demonstrate the sterile technique and perform the procedure on the dummy under direct supervision.

#### (VII) Providing feedback

While observing each learner performing the procedure, individual and immediate feedback and guidance can be provided and any questions can be answered. In addition, feedback from other learners observing the performance is very helpful.

#### (VIII) Assessing the performance

At this point, the students demonstrate what they have learned without receiving additional coaching or hints. However, a single performance does not ensure that the new capability has been reliably stored and additional practice is needed.

In our session, this will constitute demonstration of the whole procedure by the learner without prompt or guidance. The main issue here is time and resources. If there is enough time, or if an additional session is organised, they can practice the procedure a few times and at the end demonstrate their performance. It is not possible to assess the desired outcome, insertion of a peritoneal drain on "a real patient" in the same session but during on-calls and on the wards, the learners get a chance of performing the procedure. Due to invasive nature of the procedure, they "must" be supervised and assisted initially and after practicing a few times, they will be able to perform it independently.

#### (IX) Enhancing retention and transfer

Once we are reasonably sure that the new capabilities are reliably stored, we can increase the

likelihood that they will be retained over a long time period by providing practice and spaced reviews. The repetition of learned concepts is an effective mean of enhancing retention, although often disliked by students. Additionally, transfer of knowledge and skills to new problems and situations is a goal of most instruction, but classroom time constraint makes it more difficult to achieve.

To enhance retention, the learners should practice the procedure on a dummy a few times. More frequent practice broken by rest periods is more effective. The transfer of knowledge constitutes applying their skills in a clinical setting, while initially being supervised. The session can be closed by reviewing the key points, answering the questions and asking for learners' feedback.

In designing a session like this, several factors need to be considered, including the nature of objectives, setting, time, available resources, institutional constraints, content, number of learners, their characteristics and their preferences. The most effective way to achieve psychomotor objectives is to get the learners to perform and practice the activity after preparing them with some lectures or demonstrations. The session should cover the 3 areas that are necessary for teaching psychomotor skills: 1) Before practice: objectives, performance criteria and how it should be performed by an expert. 2) During practice: critical cues and how to use the information. 3) After practice: feedback, enhancing retention and transfer

## Conclusions

Gagne's theories provide a great deal of valuable information to teachers. Applying Gagne's nine-step model is an excellent way to ensure an effective and

systematic learning program as it gives structure to the lesson plans and a holistic view to the teaching. We need to keep in mind that the exact form of these events is not something that can be specified in general for all lessons, but rather must be decided for each learning objective.

The performance most frequently required of students is to remember, while our intent is most often to help them understand, and by putting more structure into the objectives of the lesson plans we will be able to achieve this aim. As Gagne himself says, "organisation is the hallmark of effective instructional materials".

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