

# Structural Learning Theory

## General

Structural learning theory is one of the [cognitivist](#) perspectives on instructional design proposed by [Joseph Scandura](#) in 1970s. Scandura's theory suggests human **knowledge** is consisted of **rules** which are to be learned. Those rules are determined by parameters of **domain**, **procedure**, and **range**.

## What is structural learning theory?

Structural learning theory suggests that structures (problems) that a learner must learn, need to be formed as **rules** performed on a **domain**.

A domain here is defined as a set of characterizing **inputs** and **outputs**. Inputs and outputs can be anything, even a process, an idea or a concept. For example:

- list of verbs (input) → present participles (output).

Operations performed on given inputs are called rules, and they generate unique outputs. Rules can contain different levels of abstraction and are always defined with three parameters:

- **domain** - its allowed **inputs**,
- **range** - its expected outputs, and
- **procedure** - the sequence of **operations** to perform **on the inputs**.

For example: a rule *form present participle* has the domain of all English verbs, the range of present participles and the procedure of adding “-ing” ending to the verb.

Rules can be simplified into **lower-order rules** (*atomic components*) which represent most basic concepts learner needs to know when dealing with a problem from given domain. By combining these atomic components and application of more complicated to lower order rules new **higher-order rules** are derived. Higher-order rules are rules which can have other rules as inputs or outputs (for example mathematical theorems) and they can be used to solve complex problems in the whole domain.

Structural learning theory further attempts to identify components crucial for solving the given problem and is based on the procedure called *structural analysis*. Structural analysis is performed in the following steps:

1. The first step is to identify problem domain inputs and outputs, or even only outputs (representative problems).
2. Rules should be defined and explained on each representative problem. Problem domain can be both well- and ill-defined<sup>1)</sup>. In case of an ill-defined domain, it should be divided into well-defined sub-domains which can generate at least one solution rule.
3. Each solution rule should be converted into a new higher-order problem and new higher-order rules for solving them.

4. Redundant rules should be eliminated and the whole process repeated until simple enough rules are reached.

An important part of the theory is also **prior knowledge (rules)** of the learner, that will **enable construction of new rules**. This knowledge can be examined by instructor, that can be both human or artificial.

## What is the practical meaning of structural learning theory?

Structural learning theory's applications have been made in **mathematics** and **language learning**.

## Criticisms

## Keywords and most important names

- **Structural learning theory, rules, domain, range, procedures**
- [Joseph Scandura](#)

## Bibliography

[Instructional Design Theory Database Project: Structural Learning Theory](#). Retrieved March 15, 2011.

Scandura, J. M. Structural learning theory. *Instructional Design Theories and Models: An Overview of Their Current Status*: p215-245. 1984.

## Read more

Reigeluth, Charles M. *Instructional-design Theories and Models: An overview of their current status*. Routledge, 1983.

1)

An ill-defined domain is one in which rules are quite simple, yet there is no direct complete solution like chess, or poetry writing.

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