

# An Equivalent Architecture of Learner's and Instructor's Knowledge through the Matching of Intended Learning Outcome

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**Abstract.** Constructivism and instructionism, two grounded theories of learning and teaching, are contradiction in terms of practitioner's perspective. This leads to an attempt to bridge the gap between these two theories by designing the balanced approach. In this paper an equivalent architecture of learner's and instructor's knowledge is introduced via a matching strategy through the intended learning outcome.

**Keywords:** Constructivism, Instructionism, Intended Learning Outcome, ILO, Competence, Content Knowledge

## 1 Introduction

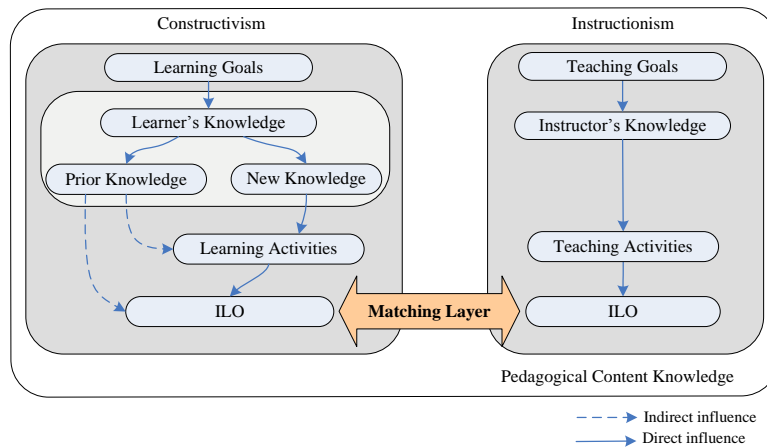
Constructivism has become prominent within the community in referring to the student-centric approach. The key idea of the constructivist learning is that, individually, the learner actively constructs his/her knowledge based on existing experiences. The realisation of self-directed learning and knowledge creation will be initiated [11]. In fact, knowledge cannot be transmitted from instructors to learners directly, but it will be actively created in the mind of individual [1]. On the other hand, many researchers focus on how to conceptualise knowledge. They tend to contribute to the mechanism of transferring instructors' knowledge to learners [4, 7]. This paradigm can be initiated by applying the instructionist approach. Instructionism has been defined as a perspective of teacher knowledge which starts from the instructor's understanding and the transmission of learning contents to the learners [9]. We argue that constructivist and instructionist theories are complementary and can be integrated. The aim of the research is to reconcile these two theories in order to construct a novel framework to be utilised for supporting learning and teaching.

In this paper two aspects of the research are discussed. The former is an equivalent architecture of learner's and instructor's knowledge which is introduced to improve the efficiency and effectiveness of learning and teaching. The later is a matching strategy through the intended learning outcome (ILO) defined for both the learner's and the instructor's perspectives.

## 2. An Equivalent Architecture: The CIMM Model

The research methodology originates from the hypothesis that, based on the learner's experiences, the learner who comprehends the suitable content knowledge can reach the achievement goals. The content knowledge means the amount and organisation of knowledge in the mind of the instructor [6, 9, 10]. This reveals the primary idea of the equivalent of learner's and instructor's knowledge. Originally, the balanced approach of the research is based on the trichotomous framework which conceptualises the relationship between three main components, namely, constructivism, instructionism and learning materials [12]. Firstly, the constructivist component is representative of the learner who aims to personally construct new knowledge by referring to the existing experiences. Secondly, the instructionist component is representative of the instructor who tends to provide suitable learning materials and suggests possible learning activities to the learner in order to achieve the learning goals. Finally, the learning materials are the repository of the model accumulating the learning contents provided by the instructor.

In this paper, the constructivism and instructionism matching model, the so-called CIMM model, has been proposed to conceptualise the hierarchical structure of the relationship between constructivism and instructionism as the pedagogical layer (illustrated in Fig. 1). The core strategy of the model is the matching layer of the ILO within the pedagogical content knowledge which can be categorised into four different layers, namely, goal layer, knowledge layer, activity layer and ILO layer.



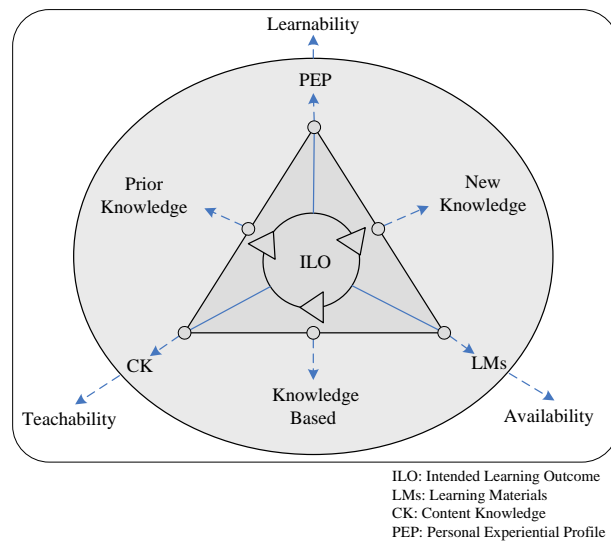
**Fig. 1.** The constructivism and instructionism matching model (CIMM Model)

Each comparable layer of the model epitomises the educational objectives of the teaching and learning. Initially, the course of study confines its learning outcome to the learning and teaching goals. Setting the learning and teaching goals is needed to be the primary concern for the course design. Secondly, in order to achieve the learning and teaching goals, learner's and instructor's knowledge should address the need to perform the learning and teaching activities in order to seek for the educational goals. Specifically, learner's knowledge can be categorised into two

categories: prior knowledge and new knowledge. Prior knowledge refers to the existing experiences that have been accumulated before taking the course module while new knowledge refers to the current finding or understanding of the learning contents. Thirdly, in order to obtain knowledge layer, the learner (and instructor) should perform the suitable learning (and teaching) activities. Finally, the ILO layer plays a crucial role as the fundamental part of the research. Due to the aim of the instructional designer, the learning outcome can be used to suggest the results of the educational activities defined in terms of what the learner should achieve by the end of the course.

## 2.1 Knowledge Boundary and Model Variables

The motivation for the proposed approach is to introduce three abilities: teachability, learnability and availability. This can be identified by the knowledge boundary of the research in accordance with the model variables (illustrated in Fig. 2).



**Fig. 2.** Knowledge Boundary and Model Variables

- **Teachability**

Teachability represents instructionist component of the model which refers to the ability to transfer teacher's knowledge (defined in terms of the content knowledge or CK) to students. The model has been designed to document the teacher's understanding of the learning contents and to transfer the understandable CK to students. Mathematically, it can be conceived that the CK should be diminished as much as possible in order to enable the learners to construct their knowledge (or understanding) by themselves. The research methodology has been designed to form the CK specialised in details solely the Subject Matter Content Knowledge, the so-called SMC. The SMC is the sub-form of the CK which refers to knowledge about the facts or concepts of the domain [8]. In this research, however, we construe the intention to form the SMC as the instructor's knowledge unit because the SMC can be

the representative unit of the core structure of the learning contents (which is called the subject matter content) utilised in the learning activities.

- **Learnability**

Learnability represents constructivist component of the model which refers to the ability to learn based on the personal experiential profiles (defined in terms of the PEP). The PEP is the learner's preferences which can be attributed to the characteristics of the learner in order to individualise the distinctive characters and behaviour of the learner. For instance, the educational background, the past experiences, or the aims or attitudes to learning, etc.

- **Availability**

Availability refers to the ability to support suitable learning materials (defined in terms of the LMs) to the learners in order to encourage them to create understanding of the learning contents with the aid of appropriate learning materials.

At the mid-point of the model, circularly, these three variables can be interacted through the ILO. The ILO will play a crucial role as the infrastructure of the research which can represent the hierarchical structure of the course syllabus. Technically, the ILO structure will be sketched based on the syllabus of the course and it will be used as the blue-print guided to generate suggested learning activities.

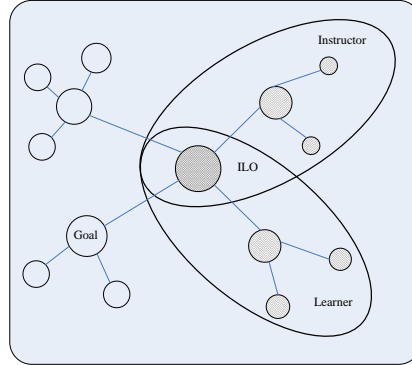
### **3. ILO Matching Strategy**

A statement, the so-called intended learning outcome (ILO), is the planned learning outcome which expresses the student's ability to be able to perform the learning activities by the end of the course modules [5]. The ILO will be commonly planned and desired before providing the learning tasks to learners [3].

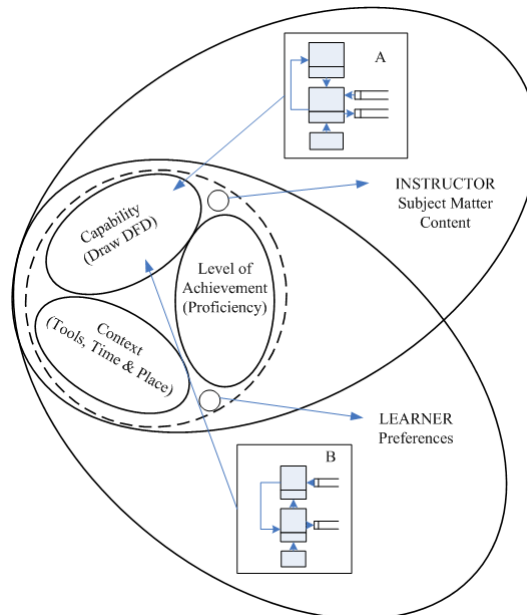
In this research, the ILO can be separated into two categories: the learner's ILO and the instructor's ILO. Traditionally, the instructor's ILO is usually assigned before starting the course of study as the instructor's perspective which is based on the curriculum. The instructor's ILO represents the scope of the learning and teaching aims whilst the learner's ILO is intentionally defined to represent the student's aims (learning aims) indicating the intended learner's knowledge that the learners want to obtain during the course.

Besides these two views, there is an overlapping perspective that normally occurs during the course of study (illustrated in Fig.3). This is because the teacher and the learner share the similar goals of the pedagogical activities: the teaching activities and the learning activities. It is the jointed intention to gain the understanding of the subject matter content (also referred to the learning content) which is the ideal of the pedagogical activities. Hence, the shared goals are determined to be the indication leading to the improvement of the learned capabilities.

The core characteristic of the ILO matching, which is represented as the jointed relationship between the learner and the instructor (illustrated in Fig. 4), consists of three main parts: capability, level of achievement, and context. Firstly, the capability (referring to the learned capability) is considered as the performance "X" which is the ability to do "X" by the end of the course of study [2]. Secondly, the level of achievement, the so-called proficiency, is the measurement of how well the learner reaches the goals. Finally, the contexts are defined as the conditions, environment, tools, or times that circumscribe the learning activities.



**Fig. 3.** An overlapping perspective of the ILO



**Fig. 4** The core characteristic of the ILO

In order to demonstrate an understandable example, Fig. 4 illustrates the core characteristic of the ILO which is elucidated an understanding of how to draw the DFD diagram. The capability expresses the ability to draw the DFD. For instance, the example shows that the teacher tends to explain the DFD "A", while the student may understand (and draw) the DFD "B". Although the teacher tends to explain the way to draw DFD, the student may realise solely some parts of the lesson. The DFD structure sketched by the teacher and student might be different, because the learner may be a novice practitioner who has limited ability to understand the subject matter content (which is referred to the DFD elements, i.e., the processes, the data flows, the inbound elements, or the outbound elements). Due to a limitation of individuals, the level of

achievement can distinguish the learner's ability based on the heterogeneous perspectives of an understanding of the subject matter contents. However, the capability and proficiency are established on the basis of the surrounding context. For example, the learning environment may encompass any kinds of tools used during the course of study, the restricted period of time, or the place (or classroom).

#### 4. Conclusion

In order to support learning and teaching, an equivalent architecture of learner's and instructor's knowledge, the so-called CIMM model, was introduced by conceptualising the hierarchy of the relationship between constructivism and instructionism. Four layers of the model were proposed to epitomise the educational objectives as well as three abilities of the approach were discussed. Moreover, the ILO matching strategy which is the core strategy of the research has been proposed and the understandable example has been discussed. The ILO structure network and its case study will be implemented for the future work.

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