Infusing Computational Thinking into the Accounting Practice Course

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ABSTRACT
In the digital age, the demand for digital talents in our commercial society has greatly increased. Digital talents mainly refer to the general names of professionals in various industries who can perform data analysis and forecast trends on the basis of the building data models. Taking Accounting Practice course as an example, this paper expounds the teaching model of integrating computational thinking into non-stem subjects. The main strategy adopted in this paper is to design different practical tasks according to three teaching difficulties. Based on the concept of constructivism, students can use different tools at different stages and find an efficient problem-solving model

KEYWORDS
Computational Thinking (CT), Constructivism, Accounting, curriculum design, framework

1. INTRODUCTION
In the era of data, enterprises are eager to make decisions, arrange inventory, advertise and deliver related consumer products by collecting and using data. Therefore, the demand for undergraduates with data analysis skills is increasing rapidly. To meet the needs of the business community, the Association of Advanced Business Schools (AACSB) takes data analysis as an essential skill into accounting practice and theory courses, and they have developed the A7 certification standard with independent AACSB certification. Accounting is a major that uses data analysis most in business disciplines, and undergraduates need to obtain more training in data analysis skills. However, it is not easy to liberate students from the complicated regulations and become masters of digital resources.

Wing (2006, 2008) defined computational thinking as a general thinking to solve problems, which was developed by others (National Research Council 2010). The accounting courses aim to develop students' skills and enable them to understand how to use data to formulate and solve business problems. The injection of computational thinking provides accounting professionals with the opportunity to use technology to analyze data and solve the data-analysis problems.

2. COMPUTATIONAL THINKING FRAMEWORK OF FINANCIAL ACCOUNTING
In this paper, our goal is to provide the CT in a practical framework and procedures for implementing computational thinking in accounting majors.

Based on the characteristics of accounting and the two dimensions of computational thinking, the research team proposes a theoretical framework for integrating computational thinking into accounting courses, as shown in Figure 1.

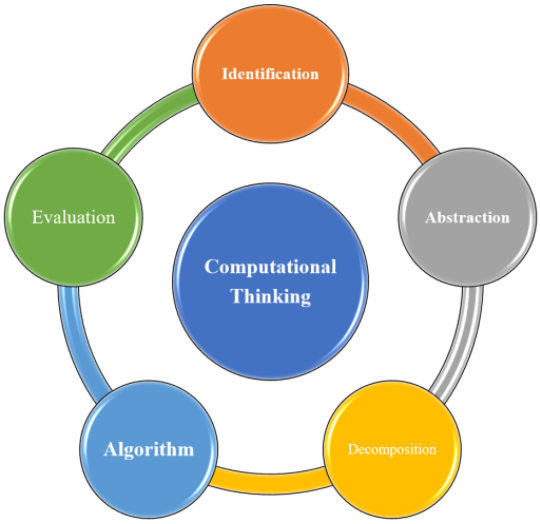

Figure 1. CT framework for integrating computational thinking with Accounting work

The proposed framework in accounting course has five components: Identification, Abstraction, Decomposition, Algorithm, as well as Evaluation (see Figure 1).

3. EXAMPLE OF CT IN ACCOUNTING COURSE
In this section，we provide an example from our framework. Here, we have carefully selected the professional course “financial statement analysis”, which has the closest relationship with data analysis skills in the accounting major as an example.

At first, instructor divides courses into three levels (see Table 1 below) according to the difficulty of using tools and course contents.

Table 1. CT classify learning Content in three difficult level

	Basic (Easy)	Mastery(Medium)	Advance(Difficult)
Identification	Identify subject, data, formula expression	Identify various indicators and can infer the relationship between each other	Identify the correct data in a fuzzy data set
Thinking process	Single-step reasoning	Multi-step reasoning	Critical thinking and multi-level reasoning
Tool (software)	Bookkeeping software	Mind-map; Excel; Tableau	Excel; Open-source software
Algorithm	Basic formula	Weighted index processing	Complex Model

We take the chapter "Application of DuPont Analysis" as an example to briefly summarize the CT application project in Zhujiang College of South China Agricultural University.

Chapter: Applications of DuPont Analysis

Objective: Based on the concept of constructivism, using the model of computational thinking to solidify students' problem-solving path, to understand and master related concepts.

Difficult level: Medium

Methods: Group cooperation/individual completion of case analysis

Tools: Mind -manager; Excel （software）

Task: Provide complete financial data for five years and incomplete data for the sixth year of an enterprise. After mastering the index decomposition of DuPont analysis, students are required to predict the ROE index of the sixth year with 5-year data.

Assessment: The instructor rates their answers based on the criteria listed in Table 2.

Table 2. Evaluation Norms based on the elements of computational thinking

Norm	A+	A	B	C
Accuracy	Completely correct	Completely correct	Partially correct	Few correct
Abstract	The formula expression completely corrects.	The formula expression completely corrects.	Can't complete all formulas	Can’t understand all formulas
Algorithm	Build Model and verify right	No Model, Calculate right	Flaws in the calculation process	Flaws in multi-step calculations, but simple calculations OK

4. DISCUSSION AND CONCLUSION

Our aim is to integrate computational thinking into practical courses of accounting major by providing a thinking framework. Applying computational thinking to practical courses and course evaluation through instructional design can encourage students to master the ability of using technical tools to solve practical problems, and enable students to have a thinking path to solve problems. The essence of the problem can only be discovered in the plight of nowhere to go. Through reasoning the characteristics of the problems in the thinking process, students finally mastered the technical tools and solved the problems. Several elements of the framework require teachers to set the difficulty levels according to task content and students' technical ability in curriculum design.

On the other hand, adding the 3A element of computational thinking to the grading index of students' homework will help to cultivate students' skills and application of learning CT in these three aspects. There are still many issues to be explored in CT application teaching of non-STEM disciplines, such as different students' preferences in the use of technology tools, and how to reconcile the differences in learning time when different students master the use of tools.

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