

國立花蓮教育大學科學教育研究所博士班九十七學年度招生考試試題

考試科目：科學教育

注意事項：

- (一)試卷共 2 頁 2 大題，合計 100 分。
- (二)答案請依序寫在答案卷上，並於題號欄中標明題號。
- (三)試題隨同答案卷一併繳回。
- (四)可攜帶不具通訊功能之計算器作答。

一、簡答題（共 4 題，每題 5 分，答題時請標明題號）

1. 請說明 pedagogical content knowledge (PCK) 與 content knowledge (CK) 及 pedagogical knowledge(PK)的區別。
2. 何謂統計學上所稱的標準差(standard deviation)，並說明其在統計上的意義。
3. 請使用建構主義的基本主張詮釋 POE 教學法。
4. 紮根理論(Grounded Theory)是質性研究中著名的進路(approach)之一，試簡要說明其涵義。

二、問答題（共 4 題，每題 20 分，答題時請標明題號）

1. 那些因素會影響學生學習自然科學（science）相關科目的興趣、動機、自信心及偏好？老師要如何因材施教？
2. 認知心理學中對於知覺(perception)理論存有一些不同的觀點，請討論關於知覺理論中 top-down 與 bottom-up 的議題，並由此申論在科學教/學中與此一議題相關的科學教學原理？
3. 請閱讀以下從 Journal of Research in Science Teaching 期刊摘錄出來的英文描述，並依據最後之中文題目用「中文」作答。
In this study we investigated junior high school students' processes of argumentation and cognitive development in science and socio-scientific

lessons. Detailed studies of the relationship between argumentation and the development of scientific knowledge are rare.These two complementary analyses enabled an exploration of their impact on each other. The microanalysis of student discourse showed that: (a) when engaging in argumentation students draw on their prior experiences and knowledge; (b) such activity enables students to consolidate their existing knowledge and elaborate their science understanding at relatively high levels of abstraction. The results also suggest that students can acquire a higher quality of argumentation that consists of well-grounded knowledge with a relatively low level of abstraction. The findings further suggest that the main indicator of whether or not a high quality of argument is likely to be attained is students' familiarity and understanding of the content of the task. The major implication of this work for developing argumentation in the classroom is the need to consider the nature and extent of students' content-specific experiences and knowledge prior to asking them to engage in argumentation.

(1)研究方法的段落被截去了，請根據文意提出你對研究設計的想法。(10分)

(2)作者最後主張：「The major implication of this work for developing argumentation in the classroom is the need to consider the nature and extent of students' content-specific experiences and knowledge prior to asking them to engage in argumentation.」你同意作者的主張嗎？為什麼？(10分)

4. 科學哲學的演進不但影響科學學習理論，同時也影響研究方法學。試說明 1960 年代以降，「科學哲學」、「科學學習理論」和「研究方法學」的演進，並說明此三者間的交互影響。