

中原大學 97 學年度碩專班入學考試

3 月 15 日 09:00-10:30 教育研究所科學教育組

誠實是我們珍視的美德，
我們喜愛「拒絕作弊，堅守正直」的你！

科目：科學課程與教學

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一、解釋下列名詞或片語:30%

1. 科學素養(Scientific literacy): 5%
2. 社會建構論(Social constructivism): 5%
3. 同化[Piaget's(1970) "Assimilation"]: 5%
4. 學科教學知識(Pedagogical content knowledge): 5%
5. 五 E 模式(BSCS 5E model): 5%
6. STS: 5%

二、請寫下一段英文主題 “The Workshop Training Model”之主要意涵(10%)，與國內目前訓練模式作比較，它有何特色？10%

The Workshop Training Model

One shot, workshop-based professional development is passive. It is common knowledge that teachers seldom apply what they learn during workshops in their classrooms. In spite of this fact, school districts and grant agencies pour millions of dollars into science teacher professional development programs that are primarily workshop based. National Science Foundation, and other funded projects that utilized a summer or after-school workshop model for science teachers. Teachers dutifully attended, received their stipends, and returned to the classroom with little support and scant application. The impact on students was hardly worth the millions of dollars. Many readers of this journal have facilitated or participated in such programs. Yet, workshop models of professional development remain prevalent because they are efficient.

In the past few years, science educators have expanded their views of professional development by addressing such factors as school contexts, teacher belief systems, support systems, follow-up, classroom application, and leadership (Czerniak, Beltyukova, Struble, Haney, & Lumpe, 2006; Loucks-Horsley, Love, Stiles, Mundry, & Hewson, 2003). The application of these models has demonstrated some impact on student learning. But a strong line of recent research outside of traditional science education circles is beginning to be used to clarify an approach to professional development that is radically different. It is time for the science education community to apply these approaches.

Over the past few years, various educators have begun to use this research along with research from the corporate world (Collins, 2001) to design and facilitate the concept of professional learning communities. What are professional learning

communities? DuFour (2005) identified the following three big ideas that characterize the basis of all professional learning communities: ensuring that students learn, building a culture of collaboration, and focusing on results. The Southwest Educational Development Laboratory (SEDL) under Shirley Hord's direction identified the following attributes of professional learning communities: shared and supportive leadership, shared values and vision, collective learning and application, supportive conditions, and shared personal practice.

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三、有關數學溝通能力，請回答下列二個問題：

1. 數學溝通能力的提升是九年一貫數學領域課程所強調的一個目標，請問數學溝通能力所指為何？ 10%
2. 教學中如何培養學生具有數學溝通能力，請列舉兩個具體做法加以說明。10%

四、請閱讀下面一段的英文，主題是“*What is an open-ended approach?*”

1. 請簡要說明這段文字的意義。20%
2. 請舉一個適合這個教學方法的問題。10%

What is an open-ended approach?

Traditional problems used in mathematics teaching in both elementary and secondary school classrooms have a common feature: that one and only one correct answer is predetermined. The problems are so well formulated that answers are either correct or incorrect and the correct one is unique. We call these problems “complete” or “closed” problems.

We propose to call problems that are formulated to have multiple correct answers “incomplete” or “open ended” problems. Many examples can easily be found. In traditional classroom teaching, when students are asked to focus on and develop different methods, ways, or approaches to getting an answer to a given problem and not on finding the answer to the problem, the students are, in a sense, facing and dealing with an open-ended problem, since what is asked for is not the answer to the problem but rather the methods for arriving at an answer. Thus, there is not just one approach but several or many.

In the teaching method that we call an “open-ended approach”, an “incomplete” problem is presented first. The lesson then proceeds by using many correct answers to the given problems to provide experience in finding something new in the process. This can be done through combining students' own knowledge, skills, or ways of thinking that have been learned.