

國立臺灣師範大學 101 學年度碩士班招生考試試題

科目：科學教育

適用系所：生命科學系

注意：1.本試題共 2 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

I. 請翻譯及解釋以下名詞。(各題 3 分。第 I 大題共 30 分)

1. Constructivism
2. Metacognition
3. The concrete operational period
4. CAI
5. Meaningful Learning
6. Collaborative Learning
7. SAPA curriculum
8. Performance assessment
9. Math and Science Gifted Students in Junior High School
10. IJSO and IBO

II. 請閱讀以下文章，寫出摘要，並說明你對這類研究取向的評論。(摘要 15 分，說明評論 15 分。第 II 題共 30 分)

How can we improve mathematics and science education? First, it is never too soon to start. From their earliest years, children are developing theories about how the world works. There is reason to believe that naive theories will not take hold so firmly if scientific theories become available to them early. Furthermore, it is becoming clear that it takes a long time, and many different examples, for understanding to develop. It is not reasonable to postpone the beginning of this process to a high school or college course.

Second, teaching has to focus on the qualitative aspects of scientific and mathematical problem situations. Too quick an advance to formulas and procedures will not help children acquire the kinds of analytical and representational skills they need. Extensive qualitative analysis is not common in science or mathematics teaching. It may seem to take too much classroom time, and many teachers are perhaps too inexperienced in these ways of thinking. But the new evidence about learning makes it clear that we cannot avoid taking on this task.

A focus on qualitative analysis and understanding of situations does not mean a retreat from the teaching of computational procedures or scientific formulas, or from the basic factual information in any discipline. There is definitely an important role for the traditional skills of mathematics and science and the

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facts that underlie them. But the procedures and formulas must be treated as matters that make sense, and children must be involved in the task of making sense of them. Research has not yet told us whether it is better to first become skillful at a procedure and then analyze it, or to allow procedures to grow out of understanding a situation. But research has made it clear that procedures must take on meaning and make sense or they are unlikely to be used in any situation that is at all different from the exact ones in which they were taught.

Finally, since naive theories are inevitable, teachers will probably have to confront them directly. Students may have to be forced to pit their theories against the ones they are being asked to learn, to deal with conflict between theories in much the way that scientists do. This, too, is a new challenge, for only rarely today does teaching explicitly acknowledge children's prior theories (except to mark them wrong) or even recognize the difficult intellectual work entailed in giving them up or substantially revising them.

- III. 請說明 Gardner 的 multiple intelligence 理論，並舉例說明應如何進行生物教育中教學表徵的設計，以利學生學習。(請依據此理論，舉例實際設計教學表徵)。(說明理論 10 分，教學表徵設計 15 分。第 III 題共 25 分)。
- IV. 請說明我國高中生物課程綱要的發展，目前實施的課程綱要與之前的課程綱要有何不同?(本題 15 分)