一、請根據下圖和下表提供的資訊，回答問題（50分）


![FIGURE 2 Hypothesized model.](image)

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Creativity</td>
<td>25.3</td>
<td>5.6</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2  Intrinsic motivation</td>
<td>2.9</td>
<td>.33</td>
<td>.36</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3  Extrinsic motivation</td>
<td>2.8</td>
<td>.32</td>
<td>-.2</td>
<td>.11</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4  Openness to experience</td>
<td>3.2</td>
<td>.30</td>
<td>.35</td>
<td>.33</td>
<td>-.18</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5  Self-efficacy</td>
<td>3.2</td>
<td>.37</td>
<td>.36</td>
<td>.45</td>
<td>.03</td>
<td>.12</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6  Perseverance</td>
<td>3.3</td>
<td>.44</td>
<td>-.07</td>
<td>.28</td>
<td>.12</td>
<td>-.03</td>
<td>.47</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. N = 124
*p < .05,**p < .01

※尚有試題，請翻頁繼續作答※

第 1 頁，共 4 頁
1. 根據上述資訊，最可能的論文題目為何？（論文題目可以中文或英文書寫，但不要中英夾雜）（5分）
2. 在研究方法中，我們通常稱上圖的「intrinsic motivation」和「extrinsic motivation」各為哪一類的變項，請解釋之。（10分）
3. 圖中的H1、H2、H6分別代表研究者的三個假設，根據你對創造力的瞭解，試著寫出這三個假設。（15分）
4. 表1 p<.01是什麼意思？它跟機率有何關係？（5分）
5. 從表1你可以得出什麼樣的結論？請引用表1的資料支持你的結論。（15分）

二、The following text is the abstract of an educational research report, please indicate and criticize the evidence of the internal and external validity in the research.（註：以中文或英文作答皆可；50分）

I. Background

Multiplication and division by fractions are among the most troublesome concepts in the elementary mathematics curriculum. Recent studies have shown that preservice elementary teachers in the United States do not have deep understandings of these concepts. Effective ways to improve preservice teachers' conceptual understanding of these concepts need to be identified.

II. Purpose

The purpose of the study was threefold: 1) to investigate the effectiveness of two activities in helping preservice teachers develop deeper understandings of multiplication and division by fractions; 2) to identify typical errors preservice teachers make and identify difficulties they encounter while learning these concepts; and 3) to provide examples of drawings and hands-on materials that effectively model multiplication and division by fractions for others to use in learning and teaching.

III. Setting

Preservice teachers from three mathematics methods classes of college students majoring in elementary education at a mid-sized college in central New York State during the spring semester of 2006.

※尚有試題，請翻頁繼續作答※

第2頁，共4頁
IV. Study Sample

Forty-two white preservice elementary teachers enrolled in a mathematics methods course. The experimental group consisted of 18 females and 3 males; the control group consisted of 16 females and 5 males.

V. Intervention

The study was a pretest - intervention - posttest design with control and experimental groups. Because lower-performing students tended to volunteer for the extra-credit activity (the intervention for the experimental group), blindly matched groups were formed on pretest scores. Both control group and experimental group participated in composing story problems with drawings to illustrate multiplication and division by fractions. The experimental group completed the additional activity of making hands-on materials with accompanying story problems to model multiplication and division by fractions.

VI. Control or Comparison Condition

Both the control group and the experimental group consisted of preservice teachers from several sections of the same instructor's undergraduate mathematics methods courses and were matched on pretest scores. Both groups completed the homework assignment in which they used drawings to illustrate multiplication and division by fractions. The instructor did not present lessons on these concepts to the classes until after the posttest had been completed so that the effects of these activities would not be confounded. The experimental group completed the additional activity of making hands-on materials to model these concepts. The study examined the increase in preservice teachers' conceptual understanding of multiplication and division by fractions through the two activities.
VII. Data Collection and Analysis

Both control and experimental groups were assessed with identical pretest/posttest instruments constructed by the investigators to determine both procedural knowledge of solving equations involving multiplication and division by fractions and conceptual knowledge of writing equations for story problems and using drawings to illustrate concepts. Posttest scores, student work on the assessments, drawing assignment, and hands-on materials were examined along with student comments on a survey that asked what subjects learned from participating in the intervention activity.

VIII. Findings

The two activities improved preservice teachers' understandings of these concepts as revealed by the change in scores from pretest to posttest (50.8% on pretest to 67.5% and 71.4%). Those who completed both assignments scored somewhat higher (71.4% compared to 67.5%) than those who only completed the drawing assignment, but this difference was not statistically significant. Preservice teachers reported that their understandings of these concepts improved through the activities.

IX. Conclusion

The two activities increased student understandings of multiplication and division by fractions. Although students improved through the activities, many students' understandings were still incomplete. More than two focused activities are needed to ensure deeper understanding of concepts. Preservice teachers need concrete experiences with these concepts in their mathematics classes as well as in mathematics education coursework.

Citation