

摘要

本研究主要在瞭解學生於學習完高二下的拋物線與橢圓課程後，對於拋物線單元瞭解的情況為何，以及在拋物線與橢圓之間圖像的差別是否能夠初步辨識。

本研究是以台北市立某公立高中普通班二年級的學生為研究對象，樣本數為82名。研究者透過自編經效化的試題本所測試的六個面向：拋物線的方程式、拋物線的定義、拋物線的開口方向、正焦弦長的性質、拋物線的應用、拋物線與橢圓的圖像關係等，從學生的紙筆作答中觀察及分析學生的解題方式、錯誤類型、以及其思考模式；並在紙筆測試後，透過研究者與學生面對面的訪談，深入瞭解學生填寫試卷時的想法，並分析學生真正困難之所在。

本研究的主要發現如下：

- 1、高二學生對於拋物線方程式的判斷方法中，以標準式最為熟悉，其次為一般式，而因定義式的式子較為複雜，且還須具備有幾何概念來作連結，因此學生對以定義式來判斷拋物線方程式較為困難。
- 2、學生在應用標準式、一般式、定義式來判斷拋物線開口方向的表現方面，以標準式的判斷能力最強，以定義式判斷的能力較弱。
- 3、從學生紙筆測驗的理由論述中，雖然在教學過程中並沒有強調“拋物線的正焦弦長愈長，則拋物線的開口就會愈大”的概念，但仍有過半數（53.7%）的受試者能正確推出上述的關係。
- 4、在解拋物線應用問題的表現中，有過半數（52%）的學生會誤將拋物線的曲線部分視為直線，並以相似三角形的線段成比例之關係來進行解題。此外，在透過訪談後，發現學生對於“一曲線與一直線可構成角度”有錯誤的觀念。
- 5、學生對於“從不同角度切割橢圓，是否會形成拋物線？”的問題，隨著切割的角度不同，而有不同的答題結果。

最後，研究者依據研究的過程與結果，對教師教學與課程設計上提出建議，並檢討此次研究之限制，提出日後相關研究時可以改善的地方。

Abstract

This study focuses on the errors that second grade senior high school students often make on parabola and the image relationships between parabola and ellipse after they complete parabola and ellipse courses

The participants in this study were 82 second grade students in a Taipei municipal senior high school. Validated self-made test sheets were used to measure 6 dimensions which included image relationships between parabola and ellipse, equations of parabola, definitions of parabola, open directions of parabola, properties of latus rectum, and applications of parabola. Through pen-and-paper tests, students' ways of solving problems, types of error making, and thinking processes were closely observed. Face-to-to interviews were also used to understand more deeply about students' thoughts while taking tests and their knowledge background.

The main findings are as follows:

- 1、 Second grade senior high school students had different answers to the problem, “Will parabolas be formed when an ellipse is cut from different directions?” when the cut directions differed.
- 2、 In terms of the ways of distinguishing equations of parabola, standard and general forms in order were familiar to students. However, definitions are more difficult for students because of their complex nature and required concepts of geometry.
- 3、 In terms of students' distinguishing open directions of a parabola, students made the best use of standard forms while the weakest use of definitions.
- 4、 According to the pen-and-paper tests, 53.7% of students had the concept, “the longer the latus rectum is, the bigger the open of a parabola is.”
- 5、 In terms of the applications of parabola, 52% of students were observed to view the curve of a parabola as a straight line and then solved problems via the concept of proportional characteristics between similar triangles. Besides, in the interviews, some students were noticed to have the misconception, “a curve and a straight line could make an angle”.

Finally, some suggestions were made for teachers' teaching and curriculum design based on the research process and results. The weaknesses caused by limitations in this study were also discussed for further improvement in future studies.