**Design and implementation**

(In this study, we design a genetic decomposition to evolution of the concept in the mind of the individual)

**Collection and analysis**

(In this study, we used assessment tasks, interviews, video clips to collect data and analyse it to understand concept evolution)

**Theoretical analysis**

(In this study, we use APOS theory to understand pre-service teachers’ evolution of their reasoning of conceptualising the use of manipulatives in number operations)

*Source: Asiala, M., Brown,A., De Vries, D.J., Dubinsky,E.D.& Mathews,D., 1997,’A framework for research and curriculum development in undergraduate mathematics’, in E.D Dubinsky(ed), Reading in : Cooperative learning for undergraduate mathematics, The Mathematical Associsationof America, Washington,DC*