

Figure R1: The advantage of sequence information in explaining the consistency between students' knowledge states and learning processes. Here, the horizontal axis represents the order in which target concepts are answered, and the vertical axis represents the mastery level of concepts by users obtained by SPKT under a specific perturbation ratio.

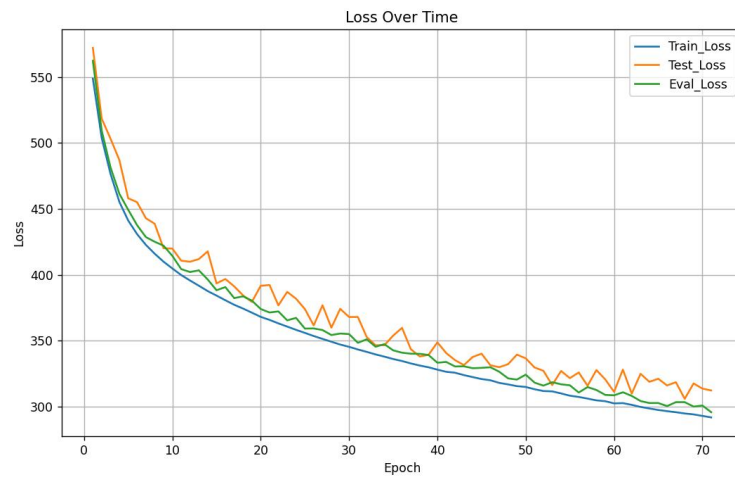


Figure R2: Changes of Train_Loss, Test_Loss, Eval_Loss with the increase of epochs.

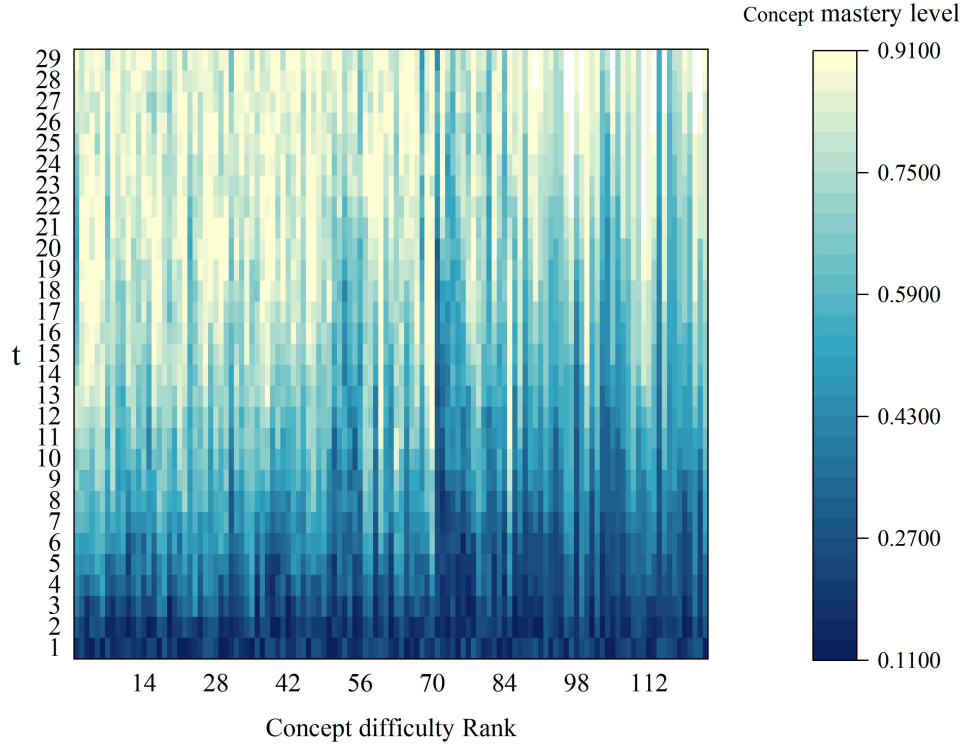


Figure R3: In the Assist09 dataset, the progressive learning process shows that easier concepts require fewer time steps to master, while more difficult concepts demand more time. The x-axis ranks concept difficulty, and the y-axis shows the number of time steps needed to answer questions.

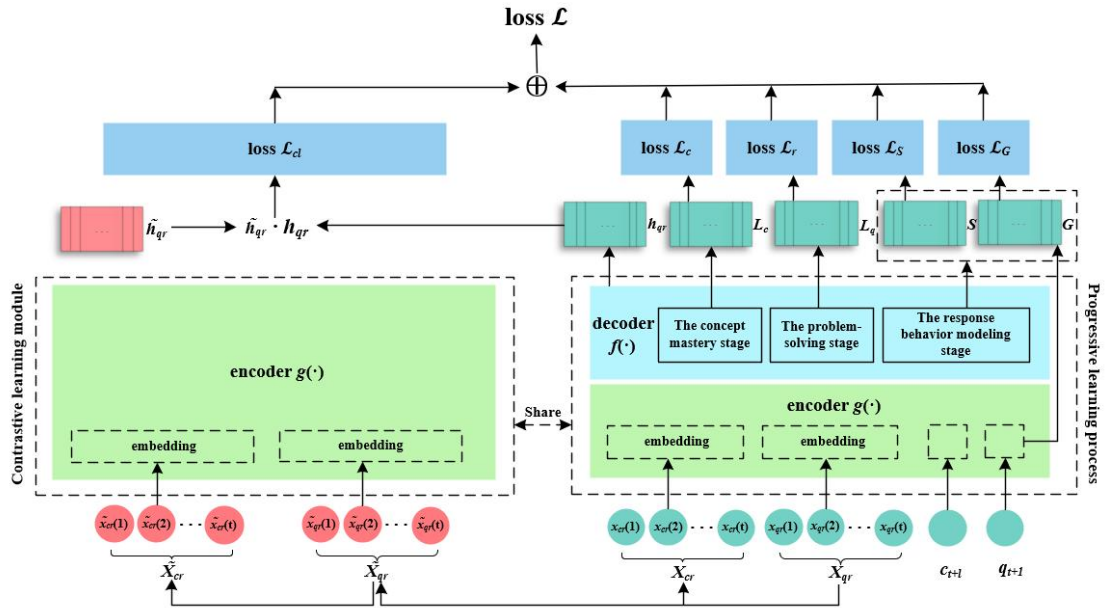


Figure R4: The SPKT Framework.