

Abstrak

Penelitian disertasi ini bertujuan untuk menghasilkan program perkuliahan Fisika Matematika berbasis *Cognitive Apprenticeship-Instruction (CA-I)* yang dapat meningkatkan keterampilan berpikir reflektif mahasiswa calon guru fisika. Penelitian ini menggunakan *Design Based Research (DBR)* dengan *mixed method* sebagai metode pengumpulan data. Penelitian ini melibatkan tiga program studi dari tiga perguruan tinggi dengan total 187 mahasiswa partisipan dan 5 dosen model. Teknik pengumpulan data dalam penelitian ini menggunakan tes, observasi, kuesioner, dan wawancara. Berdasarkan hasil penelitian ini dapat disimpulkan bahwa 1) tahapan sintaks *modeling, coaching, reflection, articulation, dan exploration* pada model *CA-I* merupakan karakteristik yang cocok untuk meningkatkan keterampilan berpikir reflektif mahasiswa calon guru fisika dalam perkuliahan Fisika Matematika berbasis *CA-I*; 2) perkuliahan berbasis *CA-I* mampu meningkatkan sepuluh aspek berpikir reflektif dalam pemecahan masalah, kegiatan *peer teaching* dalam kelompok belajar mampu mengoptimalkan aspek kemampuan menganalisis dengan akurat bahkan meningkatkan kepercayaan diri mahasiswa dalam memecahkan masalah; 3) implementasi model *CA-I* telah mampu meningkatkan rata-rata *N gain* kemampuan memecahkan masalah fisika pada kategori sedang, dan sudah sangat efektif diterapkan untuk meningkatkan keterampilan berpikir reflektif mahasiswa; 4) proses berpikir kritis dan kreatif bekerja secara *interwoven* dan *interdependent* dalam pemecahan masalah; 5) mahasiswa memberikan tanggapan positif terhadap pelaksanaan sintaks perkuliahan; 6) kendala yang dihadapi adalah belum maksimalnya pelaksanaan sintaks pada kelas eksperimen dikarenakan padatnya materi yang harus diselesaikan pada perkuliahan Fisika Matematika. Agar dapat melaksanakan model *CA-I* secara optimal disarankan bobot mata kuliah Fisika Matematika adalah 3 SKS dengan beban materi maksimum 6 pokok bahasan.

Kata kunci: *Cognitive Apprenticeship-Instruction*, keterampilan berpikir reflektif, *design based research, mixed method*, fisika matematika, bahan ajar berbasis situasi, asesmen reflektif

Abstract

This research was aimed to produce a learning program for Mathematical Physics course based on Cognitive Apprenticeship-Instruction (CA-I) model which can improve the reflective thinking skill of physics teacher candidates. As research design, design based research (DBR) was used with mixed method as a data collection method. The study involved three study programs from three universities with 187 of total number of participant students and 5 lecturers as teacher models. The data were collected using tests, observations, questionnaires, and interviews. Based on the data analysis, it can be concluded that: 1) the stage of syntax modeling, coaching, reflection, articulation, and exploration are the suitable characteristics of the CA-I-based learning program of Mathematical Physics course to improve the reflective thinking skills of physics teacher candidates; 2) CA-I-based learning program could improve ten aspects of reflective thinking process in problem solving, whereas peer teaching activities in study group could enhance the students' capability in analyzing problem accurately as well as their confidence in solving the problems; 3) the implementation of the CA-I model improved the average of N gain score of mathematical physics problem solving capability up to medium category; 4) the process of critical and creative thinking in problem solving ran interwoven and interdependently; 5) students gave positive responses to the implementation of the CA-I model; 6) the implementation of CA-I model in experimental class was not optimally performed due to the abundance topics to be addressed. Therefore, to optimize the implementation of the model, it is suggested that the topics delivered in Mathematical Physics course is limited to six topics with three credits load each semester.

Keywords: *Cognitive Apprenticeship- Instruction, reflective thinking skills, design based research, mixed method, mathematical physics, situation based teaching materials, reflective assessments*