

**PENGEMBANGAN *VIRTUAL EXPERIMENT*
SINTESIS SENYAWA ANORGANIK SEBAGAI JEMBATAN INTERELASI
PENGUASAAN KONSEP, BERPIKIR REFLEKTIF, DAN
BEREKSPERIMEN PADA MAHASISWA CALON GURU KIMIA**

ABSTRAK

Penguasaan konsep, berpikir reflektif, dan bereksperimen, serta interelasinya, merupakan bagian dari kompetensi profesional yang harus dimiliki oleh calon guru kimia. Keterbatasan waktu, fasilitas, dan kesempatan untuk bereksperimen dapat menjadi kendala pencapaian hal ini. *Virtual Experiment* dapat menjadi solusi alternatif. Penelitian ini dilakukan dengan menggunakan desain *mixed-method* tipe *exploratory*. *Virtual Experiment* telah dikonstruksi menggunakan tahapan *Model of Educational Reconstruction* guna mengintegrasikan ketiga kemampuan secara sinergis. Analisis kurikulum, studi empiris, dan analisis struktur konten menyimpulkan bahwa eksperimen sintesis senyawa anorganik merupakan *subject matter* yang paling tepat dan lengkap untuk memberikan penguatan pemahaman konsep, berpikir reflektif dan bereksperimen, serta interelasinya. Implementasi *Virtual Experiment* sintesis senyawa anorganik (VE-SSA) menunjukkan perbedaan yang signifikan terhadap ke tiga aspek kemampuan, dengan dominasi keunggulan pada kemampuan eksperimen. Konsep yang memperoleh penguatan diantaranya adalah termokimia, kinetika, stoikiometri, ikatan kimia, kimia koordinasi, karakteristik sifat fisika-kimia senyawa anorganik, dan pemahaman terhadap beberapa instrumentasi kimia. Kemampuan eksperimen yang mengalami penguatan kemampuan adalah kemampuan merefluks, titrasi, rekristalisasi dan pengenalan beberapa penggunaan instrumen kimia yang jarang dilakukan pada eksperimen riil seperti alat ukur titik leleh, *X-Ray Diffraction* (XRD) dan *Scanning Electron Microscope* (SEM). Kemampuan berpikir reflektif yang menjembatani penguatan interelasi konsep dan eksperimen juga memberikan hasil yang positif dengan dominasi peningkatan kemampuan akurasi dan presisi. Hasil pengembangan VE-SSA pada implementasinya menunjukkan perannya sebagai *reflective thinking tool* guna menjembatani kemampuan kognitif dan psikomotor mahasiswa, serta interelasinya.

**THE DEVELOPMENT OF VIRTUAL EXPERIMENT ON
INORGANIC COMPOUNDS' SYNTHESIS AS A BRIDGE TO
INTERRELATE CONCEPT MASTERY, REFLECTIVE THINKING, AND
EXPERIMENT SKILLS FOR PRE-SERVICE CHEMISTRY TEACHER**

ABSTRACT

Concepts mastery, reflective thinking, and experiment skills, and its interrelations are the part of professional competency that required by pre-service chemistry teachers. Limitations of time, facilities, and experiment opportunity may constrain the achievement. Virtual Experiment is an alternative solution. The Virtual Experiment was constructed using the Model of Educational Reconstruction design to integrate all of skills synergistically. The followed up research was done on using a mixed method design. Curriculum analysis, empirical studies, and analysis of content structure concluded the synthesis of inorganic compounds as the one of accurate and complete subject matter, to facilitate the interrelation of concepts mastery and relective thinking, and experiment skills. Implementation of Virtual Experiment synthesis of inorganic compounds (VE-SSA) showed a significant difference to all aspects of ability, in which experiment skills showed the greatest improvement. Thermochemistry, kinetics, stoichiometry, chemical bonding, coordination chemistry, the physical-chemical properties of inorganic compounds, showed the increase achievement as well as the understanding of some chemical instrumentation. The experiment skills that have been strengthened were reflux, titration, recrystallization skills. The Virtual Experiment also introduced some chemical instruments are rarely used in real experiments such as melting point apparatus, X-Ray Diffraction (XRD) and Scanning Electron Microscope (SEM). In this research, Virtual Experiment showed a good role as reflective thinking tool that bridge interrelation of concepts and experiments and gave positive impact especially to accuracy and precision skills. The implementation of VE-SSA showed its role as a reflective thinking tool to bridge the students' cognitive and psychomotor skills as well as its interrelation.