

**ANALISIS KONSEPSI, *THRESHOLD CONCEPT*, DAN *TROUBLESOME KNOWLEDGE* MENGGUNAKAN TES DIAGNOSTIK MODEL MENTAL *INTERVIEW ABOUT EVENT* (TDM-IAE) PADA MATERI REAKSI KIMIA**

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*diajukan untuk memenuhi sebagian syarat untuk memperoleh gelar Magister Pendidikan Kimia*



Oleh:

Annisa Mailia Ulfa  
NIM 1706521

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Oleh  
Annisa Mailia Ulfa  
S.Pd Universitas Riau, 2016

Sebuah Tesis yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Magister Pendidikan (M.Pd) pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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## LEMBAR PENGESAHAN

### **ANALISIS KONSEPSI, *THRESHOLD CONCEPT*, DAN *TROUBLESOME KNOWLEDGE* MENGGUNAKAN TES DIAGNOSTIK MODEL MENTAL INTERVIEW ABOUT EVENT (TDM-IAE) PADA MATERI REAKSI KIMIA**

Oleh :

Annisa Mailia Ulfa

NIM. 1706521

disetujui dan disahkan oleh:

Pembimbing I



Dr. Wiji, M.Si

NIP. 19720430200121001

Pembimbing II



Dr. Sri Mulyani, M.Si

NIP. 196111151986012001

Mengetahui,

Ketua Program Studi Pendidikan Kimia



Dr. Hendrawan, M.Si

NIP. 196309111989011001

# Analisis Konsepsi, *Threshold Concept*, dan *Troublesome Knowledge* Menggunakan Tes Diagnostik Model Mental *Inview about Event* (TDM-IAE) pada Materi Reaksi Kimia

Annisa Mailia Ulfa (1706521)

## ABSTRAK

Penelitian ini bertujuan untuk menganalisis konsepsi, *threshold concept*, dan *troublesome knowledge* pada materi reaksi kimia. Penelitian ini menggunakan pendekatan kualitatif dengan metode studi kasus. Konsepsi siswa terbagi atas konsepsi yang benar, konsepsi yang salah (miskonsepsi), dan konsepsi yang tidak diketahui dasar pengambilannya (tidak paham konsep). Konsepsi yang benar terdiri dari: reaktan pada reaksi antara larutan timbal(II) nitrat dengan larutan kalium iodida adalah larutan  $Pb(NO_3)_2$  dan larutan KI, sedangkan produknya adalah endapan  $PbI_2$  dan larutan  $KNO_3$ . Reaktan pada reaksi antara padatan kalsium karbonat dengan larutan asam klorida adalah padatan  $CaCO_3$  dan larutan HCl, sedangkan produknya adalah gas  $CO_2$ , larutan  $CaCl_2$  dan  $H_2O$ . Reaktan pada reaksi antara padatan kalsium oksida dengan air adalah padatan  $CaO$  dan  $H_2O$ , sedangkan produknya adalah larutan  $Ca(OH)_2$ , fasa masing-masing senyawa adalah  $Pb(NO_3)_2(aq)$ ,  $KI(aq)$ ,  $CaCO_3(s)$ ,  $HCl(aq)$ ,  $CaO(s)$ ,  $H_2O(l)$ ,  $PbI_2(s)$ ,  $KNO_3(aq)$ ,  $CO_2(g)$ ,  $CaCl_2(aq)$ ,  $Ca(OH)_2(aq)$ , semua reaktan dan produk adalah senyawa, rumus kimia kalium iodida: KI, asam klorida: HCl, kalsium karbonat:  $CaCO_3$ , kalsium oksida: CaO, air:  $H_2O$ , nama senyawa  $KNO_3$ : kalium nitrat,  $CO_2$ : karbon dioksida,  $Ca(OH)_2$ : kalsium hidroksida, Persamaan kimia yang setara adalah  $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$  dan  $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$ . Miskonsepsi yang dialami siswa terdiri dari: spesi yang bereaksi adalah  $Pb(NO_3)_2$  dengan KI membentuk  $PbI_2$  dan  $KNO_3$ , HCl dan  $CaCO_3$  menghasilkan  $CO_2$ ,  $CaCl_2$  dan  $H_2O$ , CaO dengan  $H_2O$  menghasilkan  $Ca(OH)_2$ , menuliskan  $Pb(NO_3)_2$ , KI,  $KNO_3$ , HCl,  $CaCl_2$ , dan  $Ca(OH)_2$  dalam bentuk atom netral dan tidak memberikan jarak ketika menggambarkannya, menuliskan  $PbI_2$ ,  $CaCO_3$ , dan CaO dalam bentuk ion pada persamaan ion, menggambarkan  $PbI_2$ ,  $CaCO_3$ ,  $CO_2$ ,  $H_2O$ , dan CaO hadir dalam bentuk atom netral. Konsep yang tidak dipahami siswa adalah menggambarkan spesi pada reaktan dan produk. *Threshold concept* terdiri dari: konfigurasi elektron, tata nama senyawa/rumus kimia/lambang unsur, penulisan fasa unsur/senyawa, ikatan kimia, dan Hukum Lavoisier. *Troublesome knowledge* terdiri dari: kompleksitas partikel yang terlibat dalam reaksi, istilah ion penonton/ion spektator yang tidak dimengerti, kompleksitas interaksi yang mungkin terjadi antar partikel, dan kompleksitas menerapkan Hukum Lavoisier.

**Kata Kunci :** konsepsi, *threshold concept*, *troublesome knowledge*, TDM-IAE, reaksi kimia.

# Conception, Threshold Concept, and Troublesome Knowledge Analysis Using Diagnostic Test of Mental Model Interview about Event (TDM-IAE) on Chemical Reactions

Annisa Mailia Ulfa (1706521)

## ABSTRACT

This study aims to analyze the conceptions, threshold concepts, and troublesome knowledge on chemical reactions. This research uses a qualitative approach with a case study method. Students' conceptions are divided into right conceptions, wrong conceptions (misconceptions), and conceptions that are not known to take basis (do not understand concepts). Correct conceptions consist of: the reactants in the reaction between the lead(II) nitrate solution and the potassium iodide solution are  $\text{Pb}(\text{NO}_3)_2$  solution and KI solution, while the product is  $\text{PbI}_2$  precipitate and  $\text{KNO}_3$  solution. The reactants in the reaction between calcium carbonate solids and hydrochloric acid solution are  $\text{CaCO}_3$  solids and HCl solutions, while the product is  $\text{CO}_2$  gas,  $\text{CaCl}_2$  solutions and  $\text{H}_2\text{O}$ . The reactants in the reaction between calcium oxide solids and water are solids CaO and  $\text{H}_2\text{O}$ , while the product is a solution of  $\text{Ca}(\text{OH})_2$ , the phase of each compound is  $\text{Pb}(\text{NO}_3)_2(aq)$ ,  $\text{KI}(aq)$ ,  $\text{CaCO}_3(s)$ ,  $\text{HCl}(aq)$ ,  $\text{CaO}(s)$ ,  $\text{H}_2\text{O}(l)$ ,  $\text{PbI}_2(s)$ ,  $\text{KNO}_3(aq)$ ,  $\text{CO}_2(g)$ ,  $\text{CaCl}_2(aq)$ ,  $\text{Ca}(\text{OH})_2(aq)$ , chemical formula potassium iodide: KI, hydrochloric acid: HCl, calcium carbonate:  $\text{CaCO}_3$ , calcium oxide: CaO, water:  $\text{H}_2\text{O}$ , name of the compound  $\text{KNO}_3$ : potassium nitrate,  $\text{CO}_2$ : carbon dioxide,  $\text{Ca}(\text{OH})_2$ : calcium hydroxide, the chemical equation that equivalent is  $\text{CaCO}_3(s) + 2\text{HCl}(aq) \rightarrow \text{CaCl}_2(aq) + \text{CO}_2(g) + \text{H}_2\text{O}(l)$  and  $\text{CaO}(s) + \text{H}_2\text{O}(l) \rightarrow \text{Ca}(\text{OH})_2(aq)$ . The misconceptions experienced by students consist of: the reacting species are  $\text{Pb}(\text{NO}_3)_2$  with KI forming  $\text{PbI}_2$  and  $\text{KNO}_3$ , HCl and  $\text{CaCO}_3$  produce  $\text{CO}_2$ ,  $\text{CaCl}_2$  and  $\text{H}_2\text{O}$ , CaO with  $\text{H}_2\text{O}$  produce  $\text{Ca}(\text{OH})_2$ , write  $\text{Pb}(\text{NO}_3)_2$ , KI,  $\text{KNO}_3$ , HCl,  $\text{CaCl}_2$ , and  $\text{Ca}(\text{OH})_2$  in neutral atomic form and not give distance when describing them, write  $\text{PbI}_2$ ,  $\text{CaCO}_3$ , and CaO in ionic form in the equation ion, describing  $\text{PbI}_2$ ,  $\text{CaCO}_3$ ,  $\text{CO}_2$ ,  $\text{H}_2\text{O}$ , and CaO present in the form of neutral atoms. The concept that is not understood by students is to describe the species of reactants and products. The threshold concept consists of: electron configuration, nomenclature of compounds/chemical formulas/element symbols, phase writing of elements/ compounds, chemical bonds, and Lavoisier Law. Troublesome knowledge consists of: the complexity of the particles involved in the reaction, the term spectator ion that is not understood, the complexity of the interactions that may occur between particles, and the complexity of applying Lavoisier's Law.

**Keywords :** conception, threshold concept, troublesome knowledge, TDM-IAE, chemical reaction.

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