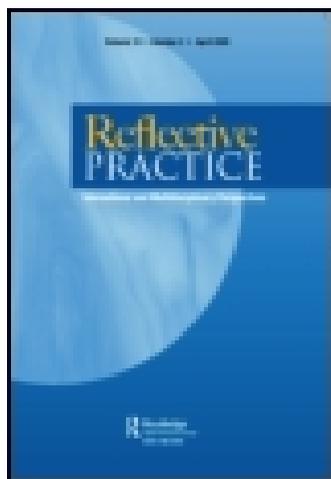


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Moments of critical realisation and appreciation: a transformative chemistry teacher reflects

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Motivated by Parker Palmer's call for teachers to understand the self who teaches, I recently completed a transformative research journey of understanding my past chemistry teaching experiences. I am a university chemistry teacher educator from Indonesia, and recently participated in a three-year longitudinal co-teaching project in lower secondary schools in Western Australia. Conducting co-teaching and narrative research stimulated me to think deeply about, and reflect critically on, my past teaching experiences. As the research involved critical reflection on my professional praxis, I adopted a multi-paradigmatic research approach with three focus paradigms – interpretivism, criticalism, and postmodernism – and designed a critical auto/ethnography as my research methodology. I applied multiple genres within arts-based research, including poetic reflections (poems), stories, dialogues within narrative, and metaphors. This journey revealed how I struggled as an unmotivated teacher to become a highly motivated and passionate teacher. I used Habermas' three interests and Schubert's curriculum images to interrogate my chemistry teaching. This journey ultimately opened up the somewhat closed box of my personal and professional practices as a teacher.

Keywords: reflective practice; transformative learning; arts-based critical auto/ethnography; chemistry teaching

Introduction

We conceal our true identities for fear of being criticized, shunned, or attacked (Palmer, 2004)

This quote from Parker Palmer resonates deeply with me in terms of my early fear of revealing and reconceptualising my teaching identity. Once I began the journey of understanding myself as a science teacher, I realised how this journey would ultimately open up the somewhat closed box of my professional identity. I agree with Palmer (2007, p. 12) that 'we rarely talk with each other about teaching in any depth – and why we should have nothing more than tips, tricks, techniques to discuss? That kind of talk fails to touch the heart of a teacher's experiences'. Palmer points out that because identity and integrity are more fundamental to good teaching than technique, teachers need to talk to each other about their inner lives. Thus, I came to realise that I needed to reflect critically on my past teaching experiences,

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not only to reveal and reconceptualise my vision of teaching, but also to empower my agency as a university teacher educator.

Early in my doctoral study, I learned that postgraduate research can transform science educators' personal and professional practices (Afonso-Nhalevilo, 2010; Cupane, 2008; Luitel, 2007; Stack, 2006). According to my doctoral research mentor and co-author of this paper, research as *transformative learning* enables educators to reconceptualise their professional practices by developing higher-order abilities such as self-realisation, opening to difference, political astuteness, visionary and ethical knowing, and agency to make the world a better place (Taylor, *in press*).

In designing a transformative research methodology, I drew epistemologies from three major research paradigms – interpretivism, criticalism, and postmodernism (Taylor, 2014). The resulting multi-paradigmatic 'arts-based critical auto/ethnography' enabled me to employ a range of methods for representing and reflecting critically and imaginatively on my personal experiences and relationships with significant others at key moments of my life (Burdell & Swadener, 1999; Ellis & Bochner, 2000). Indeed, I found imaginative autobiographical self-reflection to be a powerful way of re-thinking and revisioning my future pedagogical practice (Taylor, 2008; Taylor & Settlemaier, 2003).

Furthermore, I wanted my research writing to reach out to my colleagues and students (pre-service student teachers), to engage them in pedagogical thoughtfulness, to stimulate them to reflect critically on their own experiences, ideas, beliefs, and values in order that they might transform their future students' learning. Thus, I drew on a range of literary genres – narrative writing, poetry, imagery, and storytelling – in order to deeply engage my readers (Taylor, Taylor, & Luitel, 2012).

During my transformative 'self-study' research, I employed a range of theoretical perspectives to catalyse my critical reflective thinking. Chief amongst these were Jurgen Habermas' theory of knowledge-constitutive interests (Grundy, 1987) and William Schubert's (1986) theory of curriculum images. By combining these theoretical perspectives with narrative portrayals of key moments of my autobiographical journey to becoming a teacher, I experienced a profoundly empowering and deeply engaging scholarly journey, akin to William Pinar's (2004) notion of *curriculum as currere*, whereby students use their own lived experience as a basis for reflection, analysis and revisioning.

In this paper, I present narratives of key autobiographical moments of my journey, indicating how I employed scholarly theoretical perspectives to engage in transformative learning; a process of consciousness raising, portrayed here as moments of critical realisation and appreciation.

The journey of becoming a chemistry teacher

Teaching is the perfect job for a woman

One morning, as a happy nine-year-old I was playing with my mum in front of my house. My mother always has time to play with me before she works in the afternoon. My mother is a primary school teacher; she works from 12 pm to 5pm, and I attend the same primary school. As she is a teacher, she always asks about my schooling and she often asks my teacher about my progress.

- Mum How's school?
- Me It's good; I just don't like social studies. I find it difficult to remember the names of provinces, the cultures, and other things. I like chemistry and math which are really challenging.
- Mum That's ok, I will help you how to remember easily. If you want to be a doctor, you have to remember many things.
- Me Yes, I know, but that will be interesting, since I love to remember things in chemistry rather than in social subjects.
- Mum Why would you like to be a doctor?
- Me I like the clothes they wear, I want to use a white coat like they do, and it is cool. Doctors are rich, with big houses, cars. I would like to be rich, mom.
- Mum That's good, but don't you want to be a teacher? That's a good job for women; you can have more time for your family.
- Me I don't want to teach, mom.
- Mum I saw you yesterday, teaching your sister; that's excellent.
- Me I did because she asked me, but I just don't like teaching.
- Mum That's ok, you can choose what you want to be, don't worry about it, let's continue to play.
- Me Yes, thanks mom.

I was born and grew up in a 'teacherly' environment in Jakarta, Indonesia. My father and mother were teachers of religion. My grandfather was a teacher. Throughout my extended family many others are teachers. These circumstances influenced me in understanding the lives of teachers, however, they also made me question the idea of becoming a teacher. As a child I was not at all inspired to become a teacher. Truthfully, I saw how my parents struggled because we could not afford a good life on their teaching salaries. Even today, teachers' salaries in my country are considered low. Therefore, we had to be very cautious with our money in order to buy food, books, and clothes. My toys were considered an extravagance. This encouraged me to have a better life in the future. I planned to become a doctor, an engineer, or work in a business as there was a common belief that these jobs provided a better salary. However, it is also a common belief in my community that teaching is the perfect job for a woman. My mother always encouraged me to be a teacher. I remember this conversation with my mother. She always told me that I was good at teaching and later on I realised that teaching is actually my passion. However, my early perceptions about teaching when I was a child influenced the way I viewed teaching as my future career.

I don't want to be a teacher

Setting: The UMPTN (National Test for Government Universities' Entrance) results have been announced by the government in the newspapers. I sat the national tests since the government universities have cheaper fees than the private colleges. I took the chemistry stream because I wanted to be a chemist – I had a chemistry background from my secondary school studies. But since I had to provide two preferences for universities I chose two different universities in Jakarta. I chose these two universities because my parents wanted me to study in Jakarta, not outside Jakarta (where we were living). My first choice was Chemistry school in one of the best and well-known Government Universities and the second choice was Chemistry Education in one of the pedagogical universities. The first choice required a higher mark than the second choice. Due to the lower entry score, studying to be a chemistry teacher obviously gave me a better opportunity to pass the National test than the first university, however I had my hopes set on Chemistry school.

I read through the newspaper, I am really worried as well as excited. Today will come the announcement from the government regarding the results of UMPTN. I don't usually buy the newspaper daily, but since it is very important, I began walking at 5.30 am to go and buy the newspaper. Once the paper is in my hands, I scan through the names and the number of people who have passed the test. I have passed several pages but still haven't found my name and my test number. Suddenly my eyes become stuck on my own name – 'Yuli Rahmawati'. With heart pounding and hands shaking, my eyes look to the next table for the name of the university that I have gotten into. I find myself spontaneously opening my mouth and saying 'What??' I am really surprised; I have been granted a place at the pedagogical university. I was quite confident that my grades were high enough for the first university, because I had compared my test answers with the correct answers (these are provided by several institutions after the tests) and I knew that I had passed the minimum grade requirement. I am shocked and almost crying and my parents approach me to try to calm me down. I feel rejected, I cry, and keep telling myself, 'I don't want to be a teacher, I don't want to study in that university, I really don't want to be a teacher.'

The story is part of my journey in starting a teacher education program at one of the pedagogical universities in Indonesia. Becoming a teacher was really not inspiring for me, even though I would become a graduate with a Bachelor of Chemistry Education, and both of my parents are teachers, I was very resistant to the notion. I had none of the influencing factors that motivate people to be teachers, as stated by Richardson and Watt (2005), which are social status, career fit, prior considerations, financial rewards, and time for family. I was really hoping to finish studying soon and apply for a high-paid job in the chemical industry. As a result, I became the first student in my chemistry department to graduate within four years, where commonly students finish in five years. I really didn't want to be spending much more time in my teacher education course. This lack of motivation shaped my teaching practice in my beginning journey.

It is really evident to me now that my teacher education learning experiences were shaped by lack of motivation for being a teacher which was influenced by my lack of understanding of teaching and learning. I could say that my teacher education experiences didn't shape me to be an agent of change in improving education and empowering my students, as posited by Imig and Imig (2006). I think this was due to not only my teacher educators but also to me, as I did not have any aspiration to teach. Thus, I agree with Hoy (2008) about the importance of developing student teachers' commitment and professionalism. Henniger (2004) makes a point that is relevant to my personal experiences, that the love of teaching has two components: passion for the subject being taught and delight in teaching others. This is something I realised later on in my teaching experience.

2003 – shock therapy for a beginning teacher or finding my teaching soul for being a teacher

My first teaching experiences were very difficult. At a vocational school, I taught four science classes, each with 40 students, and all were boys. On my first day, I came to one class – electricity stream – the students were just smiling in silence. Suddenly one of them threw a lizard at me to frighten me. My face paled but I had to remain calm even though I was very afraid. Then I told them that I was not afraid of the lizard even though it was a lie! I started the lesson by introducing myself, but they did not listen to me. They only talked to each other. I was angry and became silent. I really did not know what I should do. In the end I decided to ignore their actions. I just taught the

chemistry curriculum according to my lesson plan. I did not care whether they understood or not. I just wanted to get away from the class! Up until the end of the lesson, they just talked to each other. It was my worst experience as a new teacher.

In the second class – mechanic stream – it was very noisy and the students were very badly behaved. Many of them seemed to be using drugs and often fought with students from other schools. They were real troublemakers. Before I entered this class I already knew that most teachers had serious problems teaching them. When I entered the class, none of the students were in their chairs. They ran around like kindergarten children and threw paper screwed up into balls at each other. Again I was shocked. The chairs were not in order; the class was littered with paper. I shouted but my voice was not loud or forceful enough – they were still noisy. I decided to use a ruler and I hit it on the table. Suddenly they were silent. I started my class without introducing myself. I forgot because I was really shocked. I just told them ‘I am your new teacher. Would you like to arrange the chairs and clean the classroom?’ Some of them replied ‘We don’t want to do that’. I knew I had to do something, so I told them ‘If you do not want to clean this classroom, we will not start the lesson, and you will get a zero for your chemistry lesson’. At that time I did not have any other threats besides their chemistry score. After this they started to arrange the chairs and pick up rubbish. I started the lesson even though they were still noisy. Some of them looked sleepy, their eyes looked red and their breath smelt like alcohol. This class really was the worst class. At that moment I just wanted to resign. I really did not want to be a teacher.

At home, I thought about my students. How could I deal with them? How could I keep being a chemistry teacher? How could I stay at that school for one semester? At that time I just wanted to quit. Then I talked to my parents and they forbade me to quit. They told me how wonderful being a teacher was. They told me ‘You will find that this is a wonderful job. You will have wonderful happiness as a teacher, and it is more valuable than money’. At that moment I did not understand what they meant. On a different day I talked to a senior teacher. He said that ‘Becoming a teacher is a calling from deep in your heart. Not only do you share knowledge but you also educate and equip students with good values, attitudes, and behaviours to be good people. You will understand this when they change into good people; you will be very happy’. I thought about my journey as a volunteer for street children and I remember how I felt when I was able to teach someone to read even one word. That was a wonderful moment. I asked myself, ‘Why can’t I do the same thing with my students?’ So I started my day with the promise that ‘I will finish my job, I will do the best, I will change my students’.

During the second week, I came to the school with a new spirit but with little experience of how to manage the class. I really tried to solve the problems I was facing in my classrooms. It was very difficult for me as a new teacher. So I tried to come up with some solutions. First, I tried using variations in teaching methods. I chose a demonstration method to explain acid-base material. I used acid-base indicator such as litmus paper to identify acid-base solutions. I used vinegar to identify acid and soap to identify base. Suddenly, the students were interested because the colour of the litmus paper changed to a different colour. Then I started my lesson because I had captured their attention. I also used simple language which related to their major subjects, for example, I told them about the electroplating process in car frames. I used simple electrolyte solution to show them how the process works. I used rings and pens with silver solution. Later, I discovered that some of them used the principle of electroplating process in their work. They told me that they were now interested in chemistry because it was applicable in their life. Sometimes they came to me outside the classroom just to ask about something related to chemistry, for example, about the dangers of smoking or the chemical compounds in drugs. I was very happy that they showed an interest in study.

The other strategy to help them memorise chemistry more easily was using acronyms. For example, referring to the elements in the IIA class of the Periodic Table – Be, Mg, Ca, Sr, Ba, Ra – I told students that they could memorize these using the following

words: Be (Besok), Mg(Minggu), Ca (Camping), Sr (Seregu), Ba (Bakal), Ra (Ramai). In English it means ‘Tomorrow, camping will be interesting’. This strategy not only motivated them to study but also motivated me to come up with creative words. At the end of year I tried to write chemistry textbooks for STM students with simple examples related to their life which was published one year later.

The last strategy was to become closer to them by learning their slang words, chatting and hanging around with them in the canteen. I actually became more engaged with the naughty and lazy students. I also tried to remember all of my students’ names. They were surprised that I could remember all 160 students when I had taught them for only 2 weeks. But I still had problems with students who used drugs. They slept in the classroom when under the influence. They were not conscious of their actions. It was a big problem for me that I was not able to resolve.

Eventually I quit teaching in this school when it was time to leave for postgraduate studies in Australia. However, I will always remember my students. They were my motivation. They were the people who gave me ‘shock therapy’ as a teacher. They gave me the soul to become a teacher, they taught me how to be patient, how to understand differences, how to manage my emotions, how to become a good friend and parent. I am now proud to be a teacher.

Being a beginning teacher without motivation was a tough journey for me. I started my journey as a teacher in 2003, first in a vocational secondary school and later as a teacher educator in the chemistry department of a pedagogical university in Jakarta. I had to cope with misbehaving students at the vocational school who did not like chemistry and were drug users. However, I could classify myself as a highly engaged persister (Watt & Richardson, 2008) who stays empowered to solve problems. I eventually realised that I was struggling most in classroom management, as do most beginning teachers (Doyle, 1975). I will never forget the feeling of anger and stress trying to manage my students as a beginning teacher. I had false expectations that I would have well-behaved students who were easy to teach. At that time, I was at the stage of crossing the border from theories of teaching to actual practice – it was a stressful transition. Nevertheless, I began to realise that caring is important in dealing with classroom management. My passion for being a teacher while I taught in that school began to flourish in the face of adversity.

Teaching

Teaching is not simply a job

It is not simply transferring knowledge

It needs passion, love and caring

It needs profound patience and empathy

In teaching, you will see your influence on future generations

Never relinquish, because, as a teacher, you create the future

Looking into the mirror of my past teaching: scholarly reflections

During my time as a beginning teacher in the vocational school I slowly learned to love chemistry teaching. I began to realise that caring is important in dealing with classroom management. My passion for being a teacher while I taught in that school

really flourished in the face of adversity. I came to realise that teaching is not just a simple job that only requires passion, but also that skills, knowledge, and being adaptable to personal and external factors, including political, social, economic, and cultural factors, is also important. Later, during postgraduate studies, I encountered powerful theoretical perspectives that helped me to interrogate my past teaching experiences.

Jurgen Habermas' social philosophy, especially his theory of knowledge-constitutive human interests (Grundy, 1987), helped me to understand that human action and thinking can be represented by three guiding interests: *technical*, *practical*, and *emancipatory interests*. These human interests can be applied to many situations, including teaching. I came to realise that most of my journey from being a learner to becoming a chemistry educator had been shaped by the *technical interest*, a fundamental human interest in survival and control of the physical and social environment. In the context of education, the technical interest focuses teachers on delivering subject matter and strongly controlling students' learning.

Early in my teaching career, I focused more on students' academic performance than their learning process. The technical interest implies that scientific knowledge equates with objective reality. This renders as seemingly natural the teacher's traditional role of transferring knowledge to students' minds. I used to ignore the fact that my students had different life experiences and that they constructed knowledge differently. It shaped my teacher-centred role of 'transferring' knowledge to my students and ignoring their pre-existing knowledge. I didn't realise that my students could face problems if their knowledge did not match with the 'acceptable' concepts that I was teaching. The technical interest that governed my teaching was strongly influenced by the constraints of the standardised education system in my country, especially the national examination system.

To help reflect critically on my early teaching practice, I adopted Lakoff and Johnson's (1980) opposing metaphors of *communication as war* and *communication as dance*. This perspective helped me to realise the powerful influence of the metaphor of war on my early teaching practice. For example, Indonesian students are traditionally discouraged from thinking or speaking critically in class. Thus, it is very difficult for students to voice their opinions. This social reality influenced me as both student and teacher. Teachers become the winners and students become the losers. I remember how I tried to guide my students to have exactly the same ideas as me; the ones I recognised as 'accepted ideas'. At that time, having different ideas than the teacher was unacceptable. Thus, the metaphor of war applied in my classroom.

In reflecting on the curriculum images described by Schubert (1986), I came to realise further how the power of the technical interest governed my past curriculum practices. They were mostly shaped by the implicit teacher-centred images of *curriculum as subject matter* (i.e., covering set content) and *curriculum as cultural reproduction* (i.e., reinforcing established classroom social norms and power structures); rather than by progressive learner-centred images of *curriculum as experience* (i.e., building on students' prior knowledge), *curriculum as currere* (i.e., enabling students to reconceptualise their autobiographies and re-envision their lives), *curriculum as social reconstruction* (i.e., interrogating critically the dominant socio-cultural norms shaping our lives), or *curriculum as learning outcomes* (i.e., guiding and assessing learning according to explicit criteria). Clearly, I had focused largely on delivering the content and learning tasks to the whole class so that students could

achieve the curriculum document requirement and the content level. As a result, many students were bored and slept in the classroom. The worst effect was that around 70% of my students failed the national examination. Sometimes, I was concerned with *curriculum as experience*, but students' lived experiences were much less important to me than delivering subject matter. However, I have come to realise how meaningless my traditional teaching was for many of my students.

And when I started teaching in university and gave feedback on students' laboratory reports, I noticed that students (i.e., pre-service teachers) focused mainly on their grades. As stated by Rust (2002), giving a grade doesn't mean very much. The question of the power of numbers in assessment in relation to my students' ability is often something I asked myself about during my teaching experiences. I could not ignore the fact that giving a grade was an obligation in my education system. As a result, my students were focused more on their marks than their learning. In retrospect, I realise that I needed to consider different types of assessment that could enable students to represent their learning in different ways. I realise how technical assessment negatively influenced my students' learning as well as their self-esteem (Nicol & Macfarlane-Dick, 2006; Stiggins, 2001).

Although unknown to me at the time, Habermas' *practical interest* (Grundy, 1987) had started to shape my chemistry teaching as I developed a passion for it. The practical interest is concerned with creating conditions for unconstrained communication in social relationships; with enabling all parties to engage in open discourse that enables growth of mutual understanding of each other's perspectives. The negative outcomes of my early teaching practice – students' disengagement and failure in examinations – stimulated me to begin creating meaningful learning experiences for my students. I wanted to help them interpret and understand new knowledge. I started to recognise the importance of their lived experiences. I started to recognise the importance of constructivist learning theory (i.e., *curriculum as experience*) by exploring my students' prior knowledge and using the information to guide their conceptual development. When I helped them to make better sense of chemistry learning, I noticed that their behaviour improved greatly.

On the other hand, my past teaching practice did not reflect Habermas' *emancipatory interest*: an interest in developing students as self-regulated and autonomous learners who are critically aware of the cultural myths that constrain (perhaps distort) their identities and social relationships and that compel uncritical compliance with dominant societal norms (Taylor & Campbell-Williams, 1993). I had never considered that I might have an emancipatory teaching role in helping my students to reflect critically on their past and present lived experiences or to revision their futures (i.e., *curriculum as currere*).

However, today as a transformative-minded teacher educator, I understand the power of education for changing society. I have come to realise that I don't want my students (pre-service science teachers) to have narrow learning experiences similar to mine or, crucially, to later reproduce them unwittingly in their practice as teachers. I want to ensure they do not experience a teacher education program focused simply on memorising pedagogical content knowledge. Instead, I want them to engage in making good sense of their learning experiences, and to develop their agency as transformative teachers for the benefit of their future students and our rapidly changing society. I have come to realise the need to empower my students to participate in creating a better world. And to do this, I know that I need to work towards creating a teacher education program that incorporates all three of

Habermas' knowledge-constitutive interests – technical, practical, and emancipatory interests. Taken together they can constitute a curriculum matrix of multiple images, ranging from *curriculum as subject matter* to *curriculum as currere*.

In the line of...

In the line of understanding, I am standing
 Looking back at the tough journey
 I remember the black tunnels
 I remember the endless ways

In the line of empowerment, I am standing
 Looking back at the visions and the border
 I remember the rainbow sky
 I remember the bright light

In the line of the journey, I am standing
 I see the light at the end of black tunnels
 I see the arrows at the end of the ways
 I see the rainbow sky with the bright light

In the line of my journey, I am standing
 It is a journey of struggling
 Up and down, forward and backward
 It is a journey of mixed feelings
 Happy, sad, exciting, and miserable
 It is a journey
 A journey of empowerment and achievement

Closing notes

My transformative doctoral research evoked many emotions in me; it opened the 'black box' of my professional teaching journey. I have had to face the reality that I could have been a nightmare for my students, an experience that they may remember and replicate throughout their lives. Critical reflections on my childhood and teenage years helped me to understand the role of family and community in my life decisions. Although beginning the journey of teaching without any motivation for teaching was very challenging, by reflecting critically on that experience in conjunction with powerful scholarly perspectives, I was able to better understand the dominant structural forces governing the nature of formal teaching.

In reflecting on my early teaching, I realised that most of my teaching experiences were governed by the technical interest in focusing on transmitting subject

matter and promoting student memorisation. In terms of curricula, I realised that there are multiple images to be considered. Importantly, I know that I can't ignore the powerful factor of assessment which had constrained my teaching practice, and that I need to learn to apply alternative assessment methods for supporting learning in my classroom that can build self-regulated learning and students' confidence, rather than destroy their self-esteem as learners.

In relation to my current teacher education practice, I am challenged further by the complex structural problems confronting my country: problems of teacher quality, teacher welfare, students' engagement, students' and teachers' traditional values and beliefs, standardised assessment, and lack of infrastructure and teaching resources. As a transformative-minded educator, I continue to question myself in terms of how I should work to solve these problems, to transform the landscape of education in my country.

Journey of empowerment

I realize...

The power of objectivism in my education system

The power of standardized curriculum and assessments

The influence of disempowering learning experiences

The influence of technical interests

I am aware of...

The difficulties of shifting my paradigms

The challenges of shifting from passive learning

The problems of empowering my students

The difficulties of shifting from a controller teacher

But, I wouldn't stay...

Within all the complicated problems

Within all the limitations:

Big classes, passive learners, objectivism

Standardized curriculum and high stakes assessments

I will face those realities...

I will be going back

For myself

For my students

For my country

As a transformative, emancipatory and caring educator

Notes on contributors

Yuli is a Chemistry educator lecturer at Jakarta State University, Indonesia. As a University educator, she engages in transformative learning and research practices. Her interests are environmental education, green chemistry, transformative education, and social emotional learning. Her passion is engaging her student-teachers in transformative research approaches in different research areas. She has written three chemistry textbooks for high schools and conducted several research projects in science education which she has presented in conferences in Indonesia and Australia. Reflecting on her pedagogical experiences, she has a passion for developing transformative science education in Indonesia.

Peter Charles Taylor is the director of the Transformative Education Research Group (TERG) at Curtin University, Perth, Australia. As a university teacher he strives to engage professional educators in transformative learning. To this end he has designed an integral model of postgraduate research that enables students to draw research epistemologies and methods from multiple paradigms, especially interpretivism, criticalism, and postmodernism. Armed with these powerful tools, postgraduate researchers explore their cultural histories and identities, excavate deep-seated cultural values and beliefs, engage in utopic thinking to reconceptualize the role of education in a globalizing world, re-envision their professional practices, and develop agency to transform the culture of their institutions.

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