EMBRACING EDUCATION 4.0: PROMOTING TECHNOLOGY AND TECHNICAL SKILLS THROUGH ONLINE LEARNING COMMUNITY

Zaenal Abidin, Ph.D
Dept. of Computer Science
FMNS, Universitas Negeri Semarang

UNNES
UNIVERSITAS NEGERI SEMARANG

CURRICULUM VITAE

Zaenal Abidin

ZAENAL ABIDIN

Birth place & Date	Kudus, 04 May 1982
Office Address	**Computer Science Department** Building D5 level 2, Sekaran Campus, Gunungpati, Semarang, Indonesia - 50229
E-mail	z.abidin@mail.unnes.ac.id
Phone	+62 812 6559 2551

zabidin45   @zabidin45   @zabidin45

EDUCATION

2014 – 2018	PhD in Information Technology
	Massey University, Auckland, New Zealand
2008 – 2010	Master of Science in Computer Science
	Universitas Gadjah Mada, Yogyakarta, Indonesia
2000 – 2004	Bachelor of Science in Mathematics
	Universitas Negeri Semarang, Semarang, Indonesia

WORK EXPERIENCE

- Senior Lecturer at Dept. of Computer Science, Universitas Negeri Semarang (2012 – present)

- Teaching Assistant at Institute of Mathematics and Natural Sciences, Massey University, New Zealand (2015-2016)

- Marker at School of Management for Web programming and Database Course, Massey University, Palmerstone North, New Zealand (2014-2016)

- Lecturer at Dept. of Mathematics, Universitas Negeri Semarang (2005 – 2012)

- External Data Analyst at Central Java Regional Police (2013)

- Web Developer at Universitas Negeri Semarang (2007 – 2008)

- Visiting lecturer (UIN Walisongo Semarang, STIE BPD Jateng)
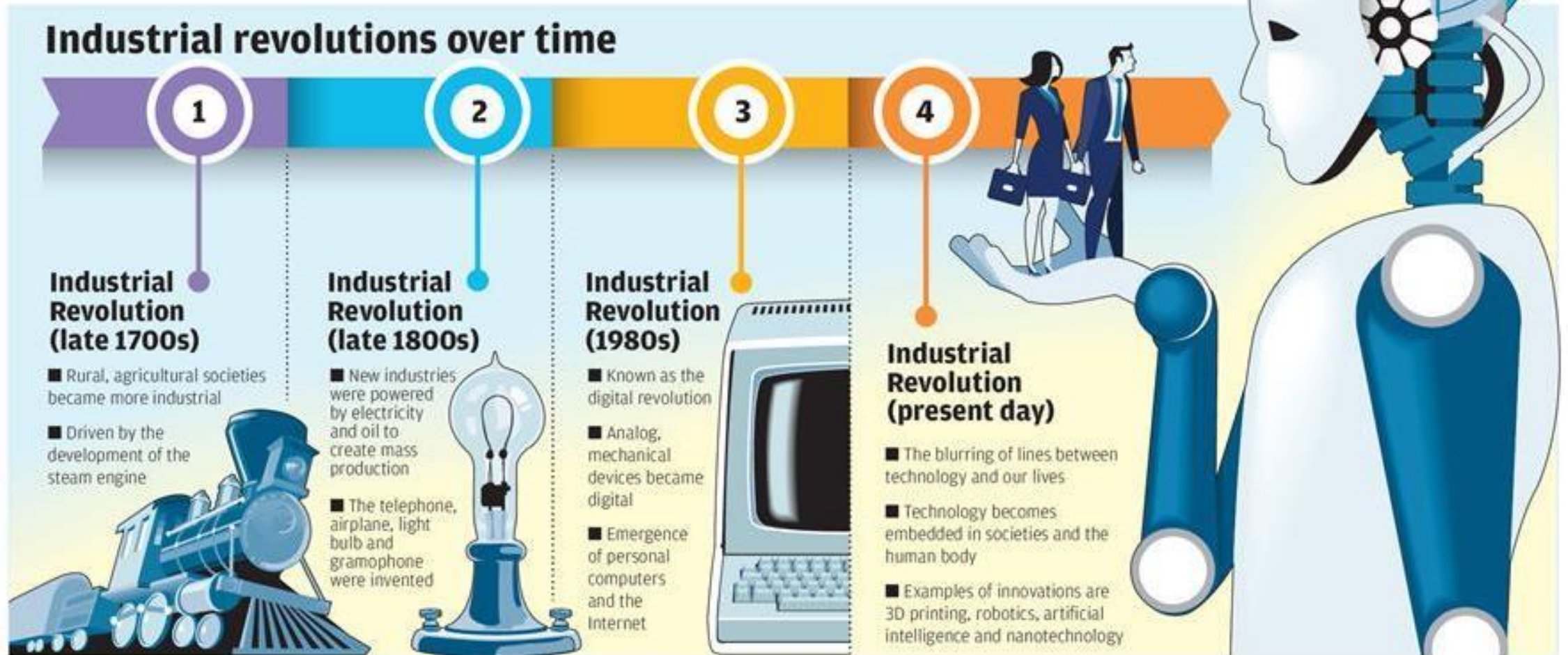
https://www.linkedin.com/in/zabidin/

RESEARCH INTEREST

- Technology-enhanced teaching/learning

- New application of technology for teaching and learning

- Information system in education

- Mathematics education

https://www.linkedin.com/in/zabidin/

THE HISTORY BEHIND INDUSTRIAL REVOLUTION 4.0

Industrial revolutions over time

1

Industrial Revolution (late 1700s)

■ Rural, agricultural societies became more industrial

■ Driven by the development of the steam engine

2

Industrial Revolution (late 1800s)

■ New industries were powered by electricity and oil to create mass production

■ The telephone, airplane, light bulb and gramophone were invented

3

Industrial Revolution (1980s)

■ Known as the digital revolution

■ Analog, mechanical devices became digital

■ Emergence of personal computers and the Internet

4

Industrial Revolution (present day)

■ The blurring of lines between technology and our lives

■ Technology becomes embedded in societies and the human body

■ Examples of innovations are 3D printing, robotics, artificial intelligence and nanotechnology

INDUSTRY 3.0 VS INDUSTRY 4.0: WHAT HAS CHANGED?

INDUSTRY 3.0

- Centralized control
- IT systems automate single machines and processes
- Connectivity inside the factory
- Dedicated Lines – Large butch runs

INDUSTRY 4.0

- Distributed intelligence and control
- IoT / cloud computing automate complex tasks across machines & factories
- Connectivity across the supply chain
- Flexible, just-in-time (JIT) manufacturing
- PLUS…
    + More sensors and information
    + Access to data for better decisions
    + Remote access to factory and machines

EDUCATION 3.0

The emergence of internet and IT changed the mode of delivery, providing a technology platform to learn

Technology driving use of interactive boards, thus replacing chalkboards

Increasing use of personal devices in colleges

Improved administrative structures through LMS

Better learning through collaborations

EDUCATION 4.0

➤ learning is connected to the learner, focused on the learner, demonstrated by the learner and led by the learner.

➤ It is the learner who is responsible for defining the various dimension of his education path — the what, where, when, how and why while moving up the learning ladder.

The learner of the future is more aware and proactive due to high levels of exposure and guidance available across different platforms

Individual GOAL!

1 How
- Delivery methods
- Teaching pedagogy
- Collaborative/self
- Financial backing

2 Why
- Career growth
- Knowledge enhancement
- Personal interest
- Degree seeking

3 Where
- On campus
- At home
- At my workplace
- Industry premises

4 When
- Self paced/fixed schedule
- Age limit
- Time duration

5 What
- Core motivation
- Required competencies
- Life skills
- Job specific knowledge

WHAT IS EDUCATION 4.0?

- Empowers learners to structure their learning paths. It is characterized by personalization of the learning experience.

- Create trained, qualified professionals who are ready for a highly globalized and digital-driven world of work.

HOW DOES EDUCATION 4.0 BENEFIT LEARNERS?

➢ Help with better learning itself

most tools and technologies that education 4.0 relies on are built to help learners learn much better and more effectively than previous teaching and learning methodologies. Often times, the learning is personalised to the learner's interest in Education 4.0, which means that there is already an inherent interest that the learning material is catering to.

➢ Make learning more accessible

from using dynamic teaching material like images and video to keep learners interested to having learning materials be accessible more easily to learners across devices and platforms to even learners being able to log in any time and from anywhere to learn at their own pace.

SKILLS NEED TO MASTER TO FACE IR 4.0 (NAIR, 2018)

- **Critical thinking** – to challenge the norm, find alternative ways of doing things, and work under constraints that lead to more efficient solutions.

- **Sound ICT literacy** – not only to use ICT systems but also analyse the strengths and weaknesses of existing systems.

- **Good Technical skills** – to operate across multiple systems and diverse industrial sectors.

- **Communication skills** – to articulate creative ideas clearly and persuasively.

- **Sound Multidisciplinary/interdisciplinary knowledge** – to have depth within a discipline and also breadth of knowledge in other disciplines.

SKILLS NEED TO MASTER TO FACE IR 4.0 (NAIR, 2018)

- **Learnability** – ability to pick up new skills quickly.

- **Strong power of association** – to combine different ideas and create value through innovation (recombinant innovation).

- **Opportunities for experimentation** – try different things and troubleshoot current practices (fostering a culture of risk-taking).

- **Fostering problem-solving and observation skills**.

- **Leadership skills** – to be a dynamic leader who is a "purpose maximiser", not a "profit maximiser".
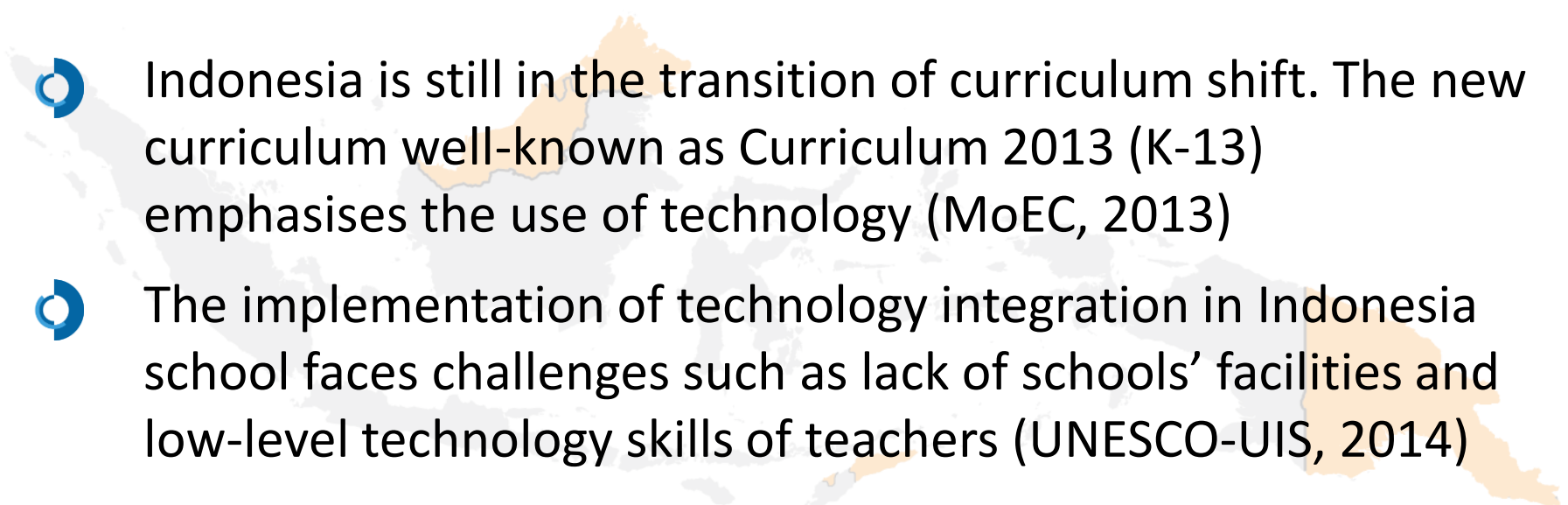
SKILLS NEED TO MASTER TO FACE IR 4.0

- Branding – Everyone has a brand, and everyone is a brand. The way you talk, the way you respond to emails, the way you introduce yourself, the way you write is your brand.
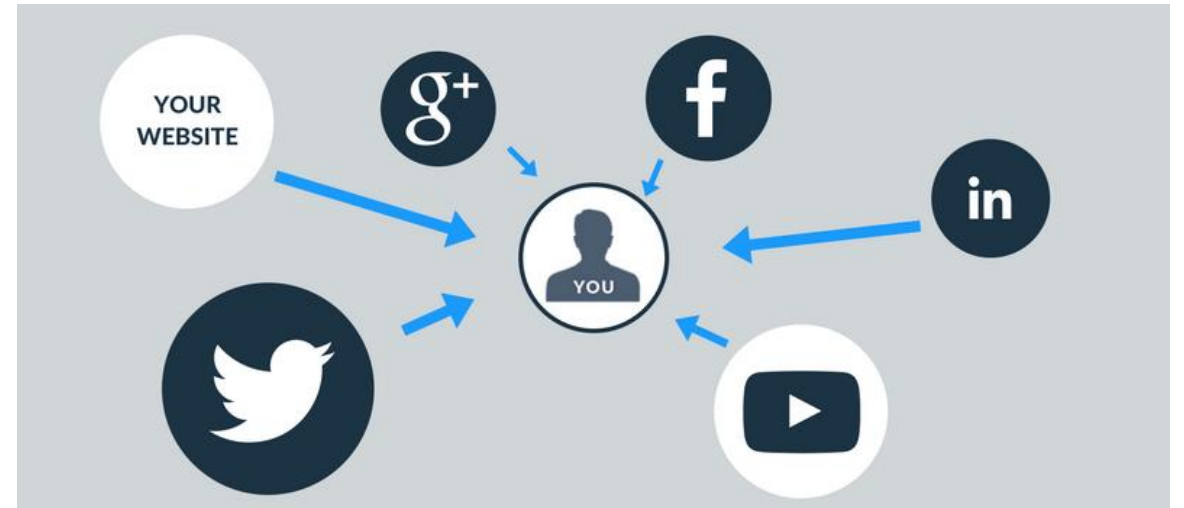
A CLOSER LOOK AT TECHNOLOGY AND EDUCATION IN INDONESIA

- Indonesia is still in the transition of curriculum shift. The new curriculum well-known as Curriculum 2013 (K-13) emphasises the use of technology (MoEC, 2013)

- The implementation of technology integration in Indonesia school faces challenges such as lack of schools' facilities and low-level technology skills of teachers (UNESCO-UIS, 2014)

- Technology use in teaching in Indonesia is still low (UNESCO-UIS, 2014)

TEACHER PROFESSIONAL DEVELOPMENT IN INDONESIA

- A number of studies related to teacher professional development (TPD) in Indonesia have been conducted (Ekawati & Kohar, 2016; Kusumah & Nurhasanah, 2017; Sari, 2012; Widodo & Riandi, 2013).

- The TPDs were conducted by government (e.g., pre-service education, national teaching certification for in-service teachers and pre-service teachers), and some education agencies.

ROADMAP SPADA INDONESIA

CREDIT TRANSFER
30 Courses (240 modules)
6 Universities, 4.200 students
PILOT PROJECT

2014

CREDIT TRANSFER
68 Courses (544 modules),
8 Universities, 1.746 students
INITIAL TRIAL

2015

CREDIT TRANSFER
25 Courses (200 modules),
6 Universities, 981 students
IMPLEMENTATION

2016

2017
DISSEMINATION
CREDIT TRANSFER
130 Courses (1.040 modules),
48 Universities, 10.575 students

1. **CREDIT TRANSFER**
2. **HYBRID LEARNING PPG**
3. **CYBER UNIVERSITY**
EXPANSION

2019

1. **CREDIT TRANSFER**
26 MK (208 module), 18 Universities
2. **HYBRID LEARNING PPG DALJAB**
53 Courses (424 module),
17.347 Participants
EXPANSION

2018
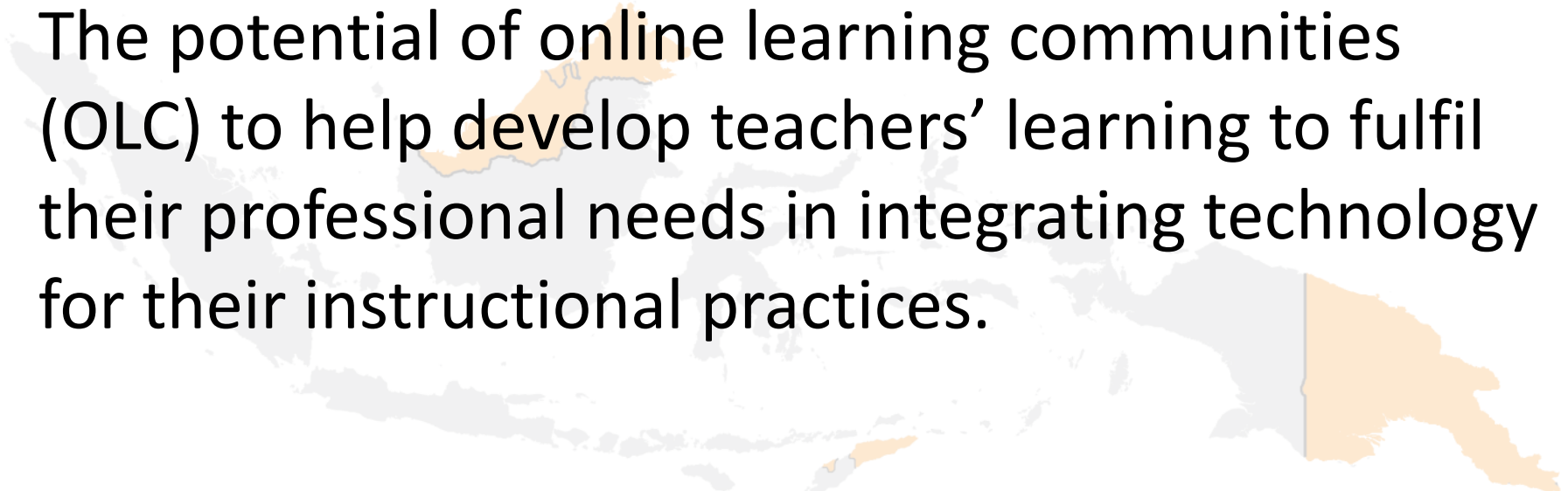
CHALLENGES OF FACE-TO-FACE TPD

- Poor attendance.

- Attendance incurs costs for travel and accommodation which are borne by the school.

- Education agencies such as the Institute for Educational Quality Assurance (*Lembaga Penjamin Mutu Pendidikan –* LPMP), the Teacher Upgrading Centre for Teacher (*Pusat Pengembangan Penataran Guru*) were unable to serve the needs of professional development for all teachers in the country.

ONLINE LEARNING COMMUNITY AS AN ALTERNATIVE

The potential of online learning communities (OLC) to help develop teachers' learning to fulfil their professional needs in integrating technology for their instructional practices.

THEORETICAL UNDERPINNING

- Tu and Corry (2002) adapt the concept of online learning communities developed by Office of Learning Technologies (1998) based on its four basic elements, namely community, learning, network, and technology.
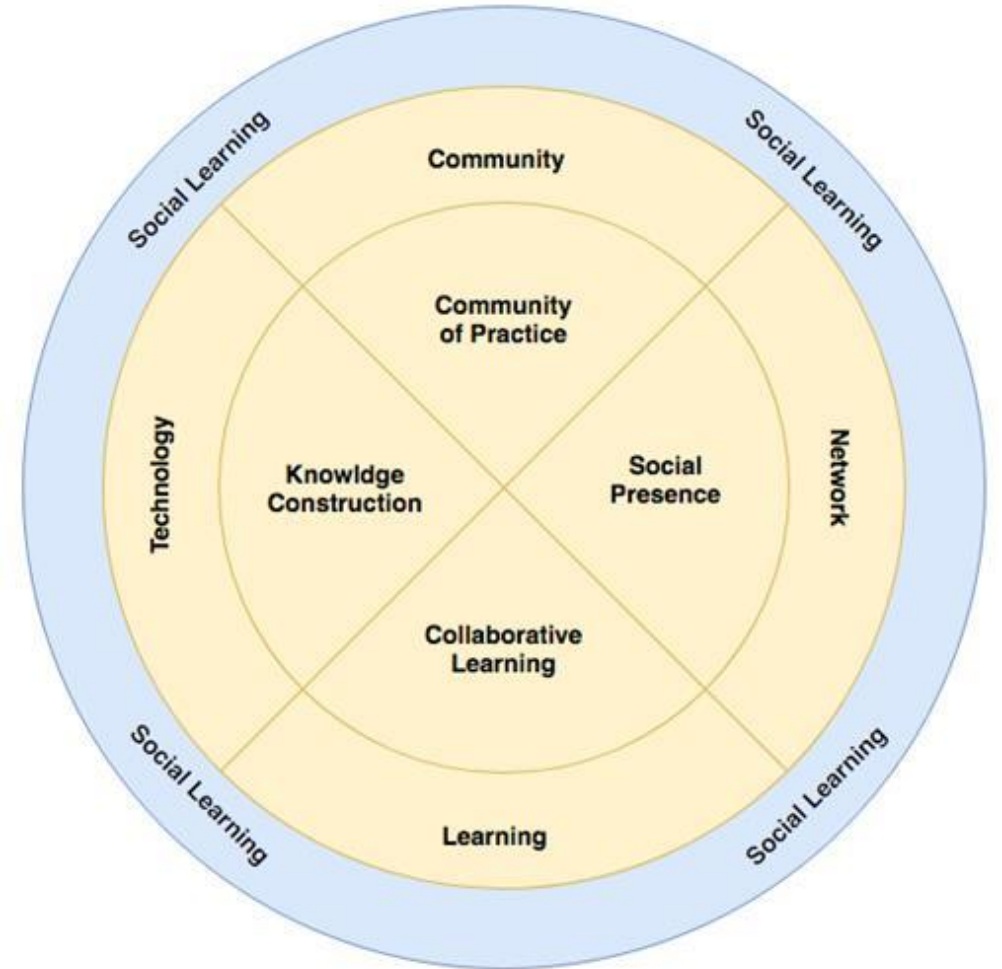
The theoretical framework for online learning community (Tu & Corry, 2002, p. 6)

- Valsiner (1997) conveys that three zone concepts (ZPD, ZFM, ZPA) are organisers of development, both interpsychologically (between people) and intrapsychologically (in the semiotic regulation of one's own thinking, feeling, and acting).
- These three zone concepts can account for the process mechanism of development and its dynamic relationship among them.
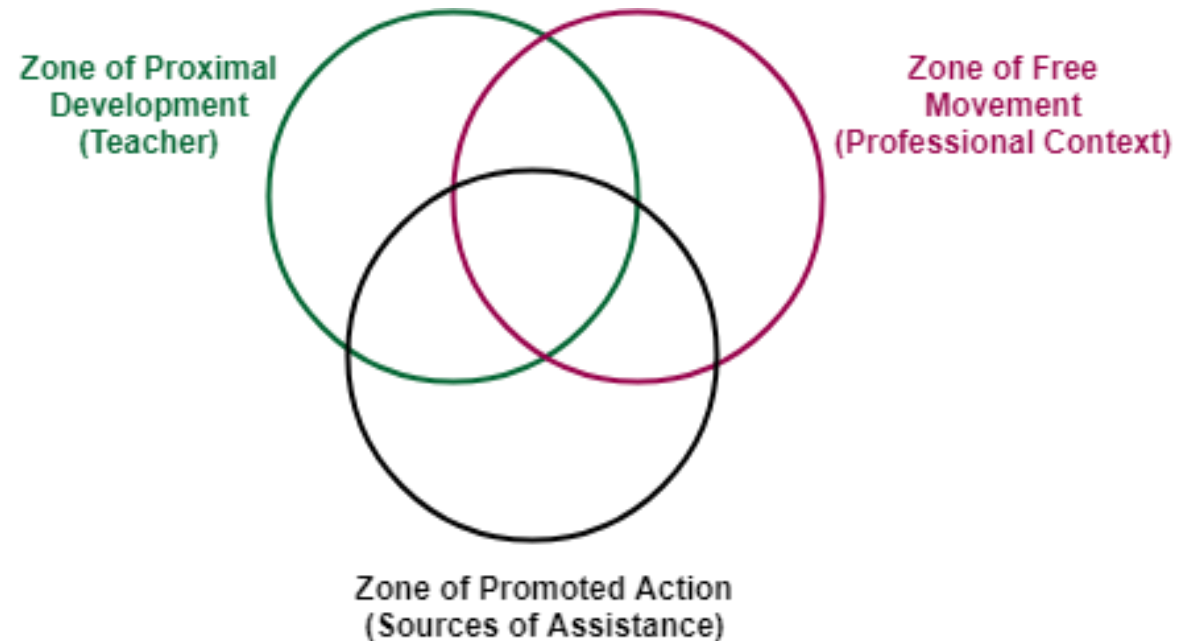
A possible zone configuration for teacher-as-learner (Goos, 2008, p. 296)

THE CONTEXT OF THE STUDY AND METHOD

❖ Approach: **An ethnographic case study**.
❖ Research participants: 420 members of OLC in Facebook, Five teachers from five different junior high schools in Semarang, Indonesia.
❖ Data were gathered through **multiple techniques**, namely surveys, interviews, participant observations, documents and online posts.
❖ Three online learning environments were established:
  ➢ The closed-Facebook group
  ➢ The private Facebook Messenger group
  ➢ The private WhatsApp group
  The first group was called as OLC-FB, the last two groups were called as OLC-IM.

ONLINE LEARNING ENVIRONMENTS

❖ OLC-FB comprised 420 members

ONLINE LEARNING ENVIRONMENTS

❖ OLC-IM comprised only 5 main participant teachers and the researcher
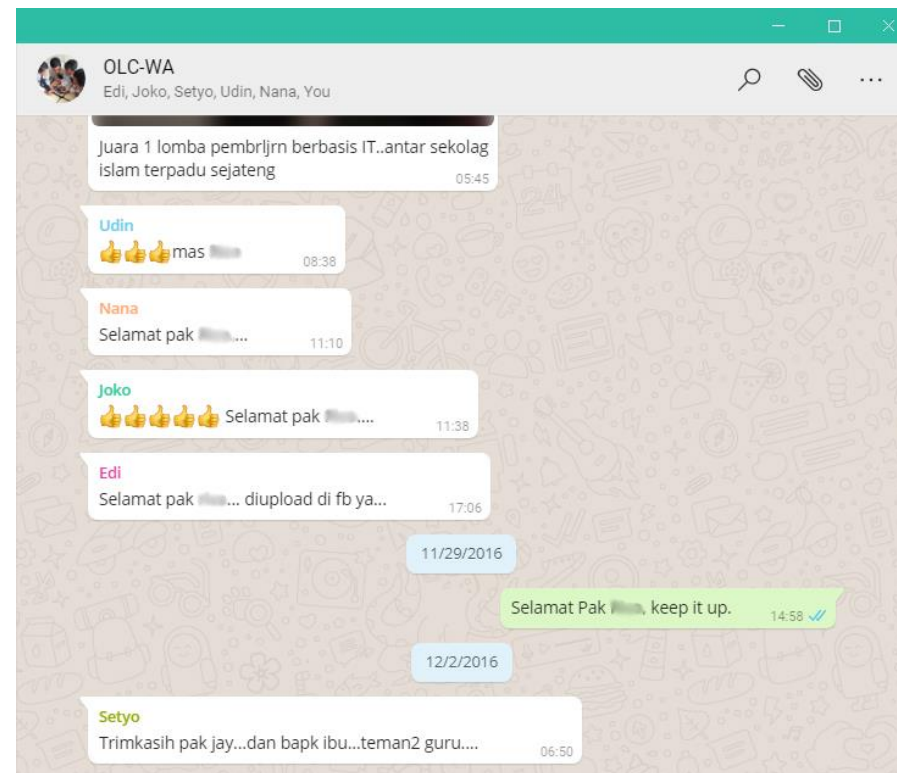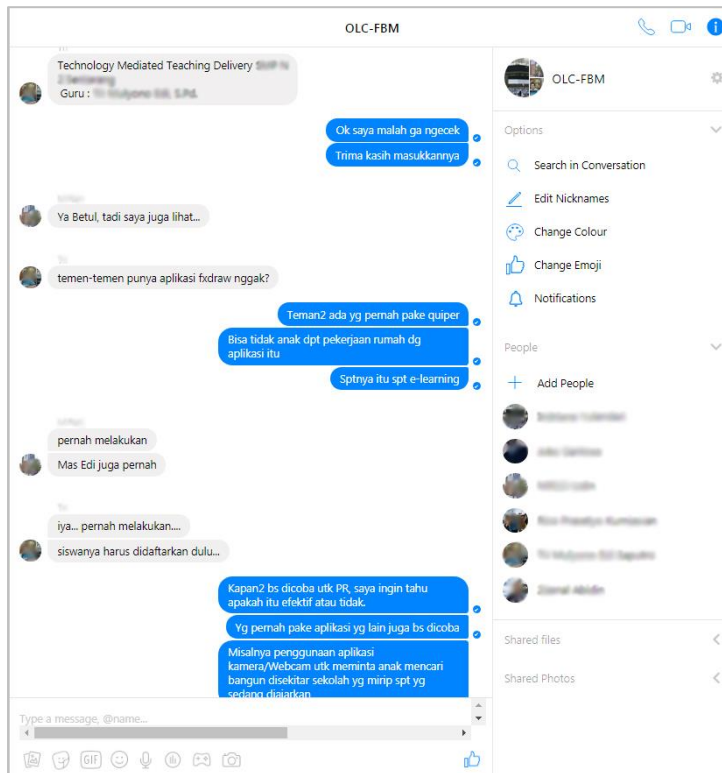
DATA COLLECTION

❖ **Preliminary Study (April – June 2015)** - Investigated current issues in school environments regarding technology-based teaching practices.

❖ **Main Study (January 2016 – May 2017)**

▪ **Phase 1:**
Technology workshop and trialing technological tools in teaching practices

▪ **Phase 2:**
Teaching practices with technology, social learning interactions in the OLC

▪ **Phase 3:**
Social learning interactions in the OLC

SOCIAL LEARNING INTERACTIONS IN THE OLC-FB

- Many community members in the OLC-FB remained what Wenger (2008) described as *lurkers*.
- Two of the OLC-FB members explained:

I think the community members who are passive in the Facebook group are because they do not have as much personal commitment to practice. They might just look for ideas about technology implementation in the classroom.

I think the community members are reluctant to engage in the online discussions on the Facebook group actively because of their concerns that their opinion can offend other members.

SOCIAL LEARNING INTERACTIONS

- Edi said:

I am not used to giving comments directly on Facebook group. I feel "pakewuh" [uncomfortable] *to give feedback in public* [a group with the wider community] *... I am more comfortable to discuss it in person or a private group such as in WhatsApp group or Facebook Messenger group*

The feeling of **ewuh pakewuh** is a personal characteristic of most Javanese people (Wati, 2014). This characteristic creates a feeling of shyness and makes people hesitate in frankly expressing their thoughts.

SOCIAL NETWORKS PATTERNS OF MEMBERS IN THE OLC-FB
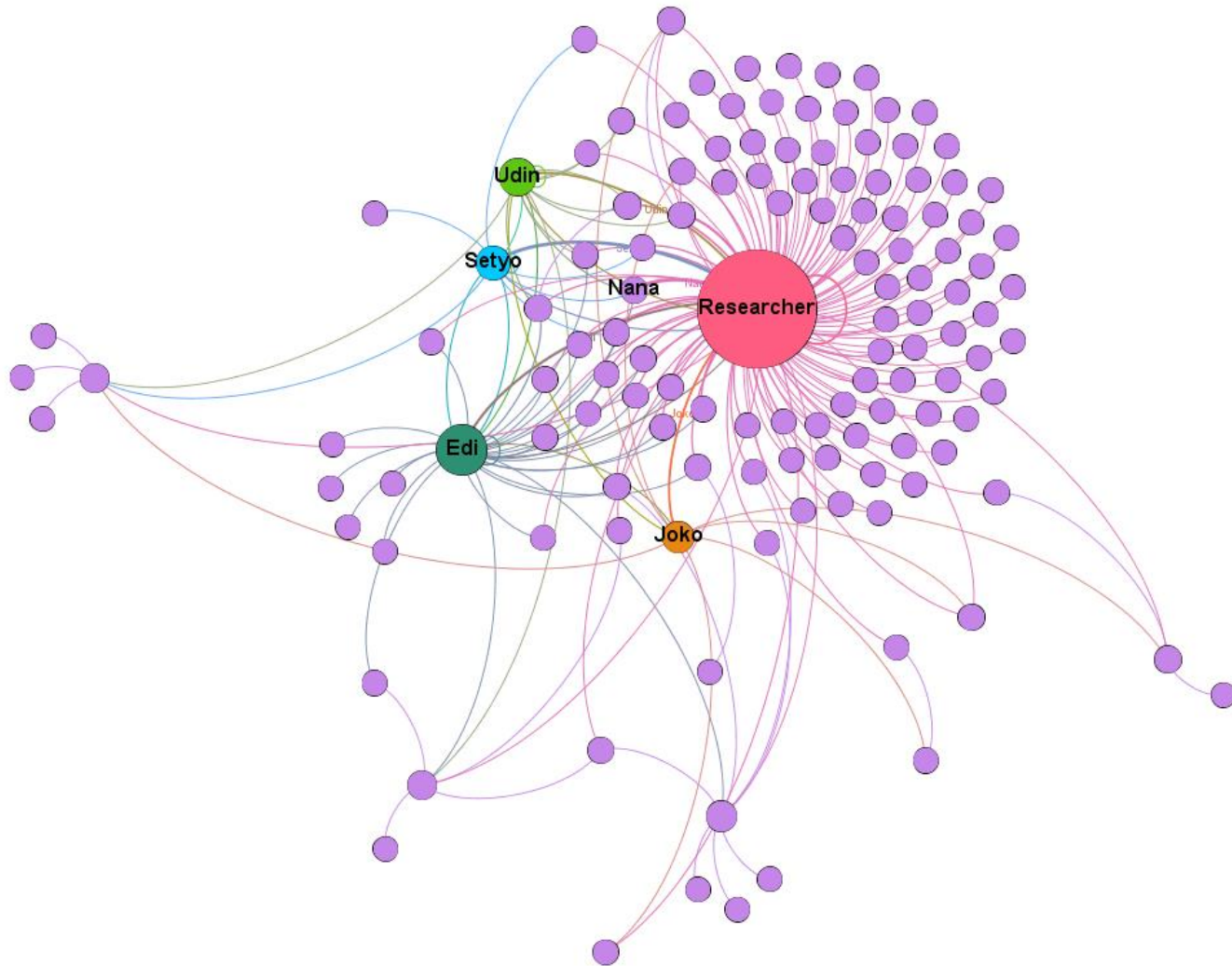

Interaction patterns of OLC-FB's members produced by the Gephi program using the "Force Atlas" spatial layout algorithm

|		
■ (purple)	0.0	(96.38%)
■ (green)	133.66666666666669	(0.72%)
■ (cyan)	134.16666666666666	(0.72%)
■ (orange)	141.83333333333334	(0.72%)
■ (dark green)	340.8333333333333	(0.72%)
■ (pink)	1486.5	(0.72%)

SOCIAL LEARNING INTERACTIONS IN THE OLC-IM

- The teachers in the OLC-IM (smaller community) were more open and receptive to receiving feedback.
- Being receptive can be regarded as what Dewey (1933) calls an attitude of open-mindedness, which is necessary for the process of reflection.
- The teachers' participation in the OLC-IM complemented their participation in the OLC-FB.

SOCIAL NETWORKS PATTERNS OF MEMBERS IN THE OLC-IM
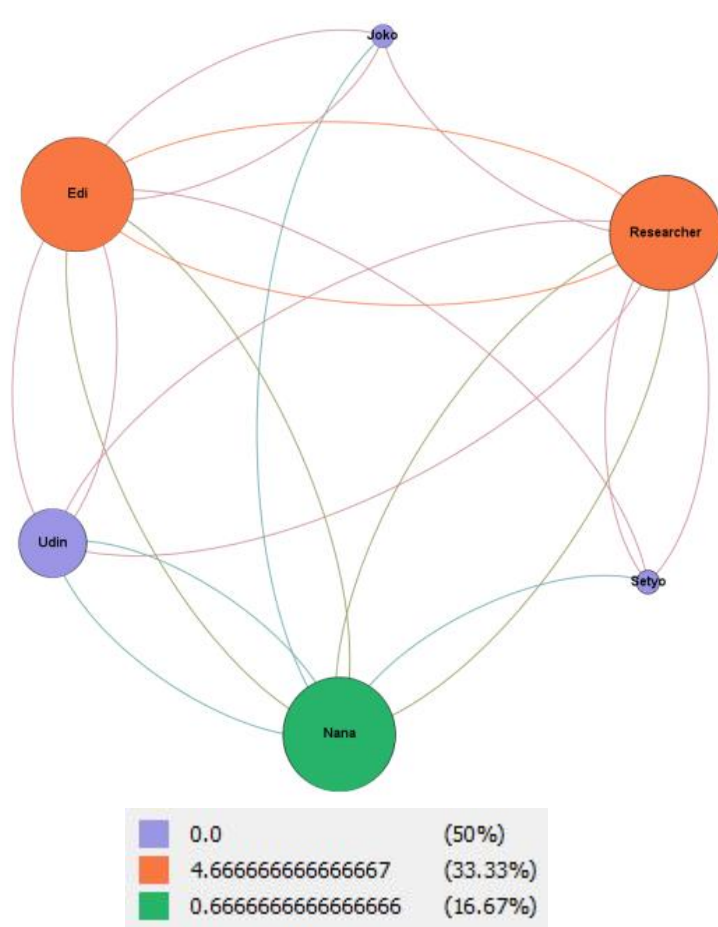
- Interaction patterns of members in the FB Messenger group using the Fruchterman-Reingold layout algorithm
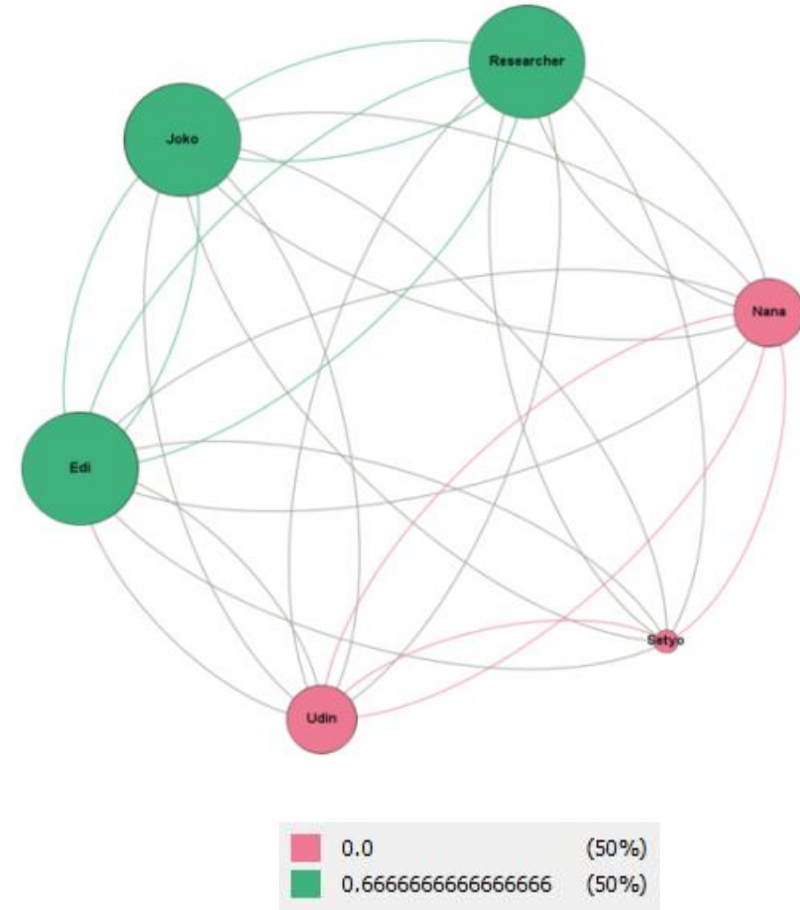
Interaction patterns of members in the WhatsApp group using the Fruchterman-Reingold layout algorithm

CULTURAL CONTEXT

- The cultural of *ewuh pakewuh* makes individuals felt *sungkanan*, which means hesitation to refuse (Artiawati, 2017).
- The feeling of *ewuh pakewuh* caused the teachers to be reticent to express their thoughts in the OLC-FB.
- They felt that since they were *gurus* (an Indonesian term for teachers), they could not openly raise their doubts to other teachers. *Guru iku digugu omongane lan ditiru kelakoane*, in the Javanese language, means that the speech of teacher is always copied, and their behaviour is always an example (model) for everybody (Artiawati, 2017).

EDI'S CASE STUDY

- In the initial implementation of technology Edi chose the Plickers app. Edi said:

I choose the Plickers app because students do not need to bring mobile phones. The internet connection can be optimised

EDI'S CASE STUDY

Edi acknowledged that his participation in the technology workshop and the OLC helped him to improve his knowledge of teaching with technology. Edi explained:

They [the technology workshop and the OLC] *give me benefits especially in the learning process of the use of technological tools in the classroom. I can improve my knowledge about how to implement the things* [technology-based teaching practices] *that have been performed by the four teachers.*

Constructing angles using a compass and the GeoGebra app

Edi demonstrated how to construct angles (30°, 60°, and 90°) using a compass on the whiteboard complied with the basic concept of drawing angles. Edi then asked students to construct angles manually using a compass on their books. The students were also asked to check the results using a protractor. Edi continued his lesson by demonstrating how to construct angles with GeoGebra. But before he demonstrated this, he grouped the students into eight student groups because only eight laptops were available. After Edi finished demonstrating it, he asked his students to practise it following guidance on the student worksheets. Edi asked the students to complete the student worksheet too. He roved and observed student group activities until all students had completed the tasks successfully. Edi then challenged the students to find ways to construct an obtuse angle of 120°. Edi said: "For those who can demonstrate the right way to construct an angle of 120° using GeoGebra in front of the class will get reward one point". Four students accepted the challenge, but Edi chose one student to demonstrate it. Other students were given opportunities to demonstrate it if they have alternative ways to construct the angles of 120°.

[Fieldnotes: ED-22]

EDI'S OUTDOOR CLASSROOM ACTIVITIES
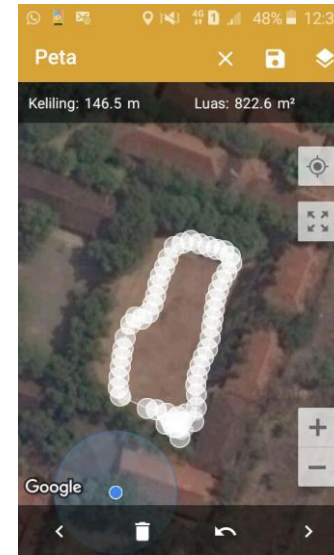
The GPS-Field Area Measure app

The Smart Protractor app

CONCLUSIONS AND IMPLICATIONS

- Evidence is provided in the findings that participating in the OLC offered opportunities for teachers to improve their professional learning.
- Lack of experiences and the cautious nature of expressing opinions were the most prominent factors that make the teachers felt *ewuh pakewuh*. This feeling affected teachers' social learning interactions in the OLC.
- OLC-based TPD model can complement the existing face-to-face teacher professional development practices. It is in that sense that the findings can be applied for re-envisioning future teacher professional development.

THANK YOU

https://www.linkedin.com/in/zabidin/