Reflective thinking among preservice teachers: A Malaysian perspective

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"The notion of reflection nowadays is considered crucial in the field of teaching and teacher education" (Clara, 2015) and relevant literature reviewed in this study has indicated support for this. We propose and test a model of reflective thinking among teachers using a sample of 1070 preservice teachers in Malaysia. Data were collected using a self-report questionnaire administered to the participants. Structural equation modelling (SEM) was employed as an analytical technique for the proposed model. The results show that reflective thinking leads to self-efficacy, self-assessment and teaching awareness, all of which are traits of competent teachers. The research model in this study also suggests that the ability to self-reflect is crucial for the development of confidence and competence among teachers. Limitations and implications for practice are also discussed.

Introduction

Reflective thinking which is part of the reflective practices of teachers is defined by Schon (1987) as the mindful consideration of an individual's professional actions which constitute the critical assessment of behaviours toward developing craftsmanship. Many researchers have implied that reflective thinking has a similar nature to reflection, the reflective process, and reflective practice (Burbank, Ramirez & Bates, 2012; Osterman, 1990). According to Osterman (1990), reflective thinking is a dialectic process which is integrally linked with action. Ord and Nuttall (2016) have highlighted the importance of actual learning and reflective thinking for teachers, and that such reflection needs to be accompanied by paying close attention to the sensation of learning. Burbank, Ramirez and Bates (2012) noted that reflective thinking is not only about considering strategies for implementation, but must encompass a paradigm shift from seeing problems as something to be dealt with, to seeing them as opportunities for self-reflection and the emergence of new possibilities. Developing preservice teachers' skills in reflective thinking has been an essential goal for learning and transformation in higher education in Malaysia (DeWitt, Alias & Siraj, 2016).

According to the *Malaysia Education Blueprint 2015-2025* for higher education (MEB) (Ministry of Education Malaysia, 2015) employers have reported that many Malaysian graduates lack critical thinking and communication skills which are crucial for success in the 21st century. One of the six aspirations for students in the *Blueprint* is to acquire thinking skills that will include an appreciation of diverse views, enable critical thinking, and be innovative. According to Dewey (1963), experience alone is not cognitive in nature, hence will not stimulate students to think about it because an experience is not the same as thought. Therefore students must be guided to derive meaning from the experience through reflection by their teachers. Felton and Kuhn (2007) further noted that critical thinking, which is the process of analysing and evaluating something in order

to form a judgement, requires considerable effort and students will engage in the cognitively complex process only if they think it is worth the effort. Hence, the function of reflective thinking is to make meaning, and formulate a relationship between the experience and other experiences and create continuities (Rodgers, 2002), which is an important step to the process of critical thinking. This continuity allows for the creation of meaning in all the events that occur in a learning experience and in life.

A critical point Dewey (1963) noted is that once students direct their attention to learn and perceive a fact, it is limited by the context they are in, and this is especially true in a classroom setting. The role of the teacher is to step in to stimulate reflection of the fact, and to perceive more rather than less. Hence, it is crucial for teachers to have the skills to carry out reflective thinking themselves, and eventually become a model demonstrating the process of such thinking. However, this is not the case as research has shown that teachers themselves often do not know how to be reflective or demonstrate reflective thinking (Black, 2005; Choy & Cheah, 2009; Choy & Oo, 2012).

Literature review

Reflective thinking

Teaching is a complex task requiring a degree of self-reflection and the ability to apply situation-specific solutions in classroom settings. It is necessary for a teacher to not only have professional knowledge that is gained from outside the classroom, but also an ability to interpret their everyday experiences from within the classroom (Sparks-Langer & Colton, 1991). Barnhart and van Es (2015) found that teachers who used reflective thinking to interpret the nuances of their students' actions could respond more appropriately to their students' needs. Such reflective thinking also allowed teachers to use teaching as a learning tool, where they learn from their practice over time. Teachers who were asked to reflect on their teaching found it to be helpful in problem solving and problem resolution (Hayden & Chiu, 2015). With the call by the Malaysian Government to develop critical thinking in students as one of the six attributes to be attained, a definition of critical thinking and its relationship to reflective thinking skills has to be examined.

Rather than being a solitary undertaking, critical thinking has now been redefined by Kuhn (2016) to have shifted more to a form of social practice where it is embedded into actual and virtual contexts of others and whose reactions needs to be analysed, reflected on, and evaluated constantly. Hence, students are continually challenged to carry out reflective thinking on situations they are in, where individual competencies are contextually guided to a certain degree, requiring continued reflection in order to assess and understand the situation. Teachers who use reflective thinking know something about the effects they have on students. They are alert to the presence of power in their classroom and the possibility for misuse, knowing their actions can silence or activate students' voices (Brookfield, 1995). Individuals who are reflective about what they are doing also had fewer errors, were more critical, and learned more in their work, compared to non-reflectors (Lindh & Thorgren, 2016; Roessger, 2014).

Schon (1987) suggested that the capacity to reflect on one's actions so as to engage in a process of continuous learning is one of the characteristics of active learning. The cultivation of 'reflection-in-action' (the actual practice of reflection) while doing something, and the 'reflection-on-action' after the students has done it, is an important feature in many learning situations. Teachers can support this active learning process by asking students appropriate questions to ensure that they constantly reflect on what they are doing. However, this distinction between the two types of action is far from clear and Schon (1987) had highlighted this in his text on reflective thinking (Clara, 2015). Osterman and Kottkamp (1993) proposed a model for reflective thinking for educators which aims to bring about such behavioural changes to teaching practices through self-awareness. The model proposes that teachers can personalise the content of their subject area, to share with learners who become agents for change in their environment. The teachers are constantly reflecting on their practices and actions as facilitators for learning. Gur Sahin and Dikkartin Ovez (2012) also found that the reflective tendencies of teachers changed over time, depending on the type of schools and the subjects they were teaching. Hence, the context of this study will be to develop a model of reflective thinking for teachers based on past research.

Aim of the study

There is a knowledge gap on reflective thinking among teachers, which has received less attention in the literature than critical thinking (Coulson, Torrance & Nunn, 2007). This study will attempt to test a proposed research model for reflective thinking among teachers based on the existing literature. In the past, reflective thinking models by Dewey (1910), Schon (1987), Sparks-Langer and Colton (1991), Rodgers (2002) and Lee (2005) have attempted to describe the process of reflective thinking among teachers and students. For these models, the level/content of the reflective thinking is mainly concerned with the mastery and application of technical means to achieve educational goals. They include a simple description of reflective behaviour and are focused on developing skills to achieve that behaviour (Lee, 2005).

Choy and Oo (2012) attempted to show the link between reflective thinking and critical thinking among teachers and perceptions of themselves as teachers. However, the four scales proposed to measure reflective thinking were not put through rigorous statistical testing. The scales for the questionnaire were created based on research by Sparks-Langer and Colton (1991) and rubrics by Hamilton (2005) on reflective thinking. The items covered three major areas of development: ability to self-express, awareness of how one learns and developing lifelong learning skills. Choy and Oo (2012) decided to add another area, the belief about self and self-efficacy, because research had found these factors to be a greater influence on teachers' decision making processes and their planning than their knowledge of pedagogy (Williams & Burden, 1997) and named their instrument *Questionnaire for Reflective Thinking for Teachers* (QRTT). The results from the study were analysed based on a percentage count of the responses to the questionnaire and was not subjected to rigorous testing of relationships. All the available literature on reflective thinking to our knowledge does not show a model with tested hypotheses. Further to this, Clara (2015) noted that how reflection works is not something that is substantially known,

it is an issue that warrants much research within the literature on reflection. Most of the research studies on reflective thinking have been carried out with Western populations, hence data from an Asian population is needed for comparison.

This study has the potential to give greater clarity to the relationships between the four scales developed by Choy and Oo (2012) to measure reflective thinking among teachers in Malaysia. The following research questions are formulated for this study:

- What is the validity of a model based on the four variables to explain reflective thinking among preservice teachers?
- What are the significant relationships among the variables that predict reflective thinking among preservice teachers?
- What are the contributions of the variables: lifelong learning skills, self-assessment ability, self-belief, and teaching awareness in explaining reflective thinking among preservice teachers?

Research model and hypotheses

Figure 1 provides a conceptual framework for the influences of developing lifelong learning skills, ability to self-assess, self-belief, awareness of how one teaches, and reflective thinking. The constructs of the framework were derived using research by Sparks-Langer and Colton (1991), Hamilton (2005), and Choy and Oo (2012).
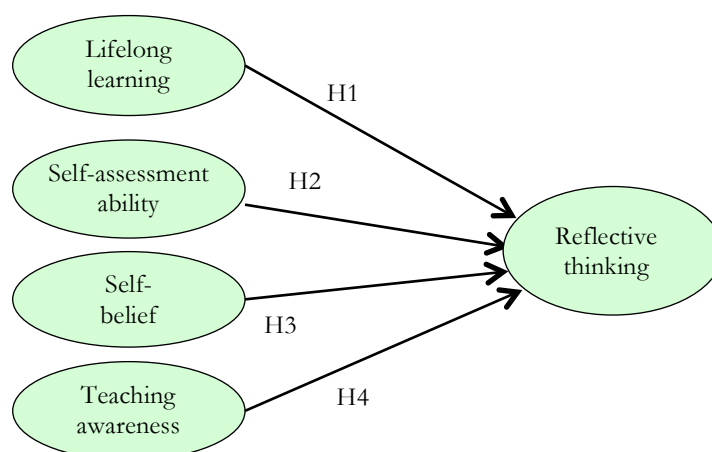

Figure 1: Conceptual framework for the influences of reflective thinking

As there are no widely accepted models of reflective thinking that have been shown to be robust, powerful, parsimonious, and capable of explaining reflective thinking among preservice teachers, we decided to use an amalgamation of research on reflective thinking to formulate the hypotheses. For each of the hypotheses, reflective thinking is defined as the mindful consideration of one's professional actions, and the critical assessment of

one's behaviours, leading to improved performance when teaching (Schon, 1987; Choy & Oo, 2012). The hypotheses are as follows.

H1: Lifelong learning skills will have a significant relationship with reflective thinking
In this study lifelong learning skills is defined as the ability of preservice teachers to carry out continuous assessment and evaluations of their teaching strategies and the influences they have on student learning. This is a strategy described by Schon (1987) and Eby and Kujawa (1994) in their reflective thinking models as a means to promote reflective thinking. Preservice teachers with adept teaching strategies that engaged students with problem-based learning were more likely to be reflective (Peters, 2015).

H2: Ability to self-assess will have a significant relationship with reflective thinking
Self-assessment ability is defined as the ability to discover and assess the strengths and weaknesses about oneself after experiencing an event. This is described by Schon (1987) as reflection-on-action and Dewey (1963) as spontaneous interpretation of the experience and is thought to promote reflective thinking. Rodgers (2002) described it as an analysis of an experience that results in reflective thinking about it. Self-assessment therefore enables preservice teachers to be reflective of what they are teaching and their relationships with students (Barromi Perlman, 2016; Lindroth, 2015; Clara, 2015).

H3: Self-belief will have a significant relationship with reflective thinking
Self-belief is defined as how preservice teachers perceive themselves in relation to their students and their ability to teach. According to Williams and Burden (1997), how teachers view themselves and their beliefs of what social interactions are most important will influence how students learn in the classroom. Pfitzner-Eden (2016) found that a teacher's self-belief changed most when in the classroom, due to two factors, having more professional experience, and having to teach different course content. Chesnut and Burley (2015) found in a meta-analysis that self-belief can also predict teacher commitment to their profession. Hence, preservice teachers' perceptions of themselves require reflection and reflective thought.

H4: Awareness of how one teaches will have a significant relationship to reflective thinking
Teaching awareness is defined as the ability of preservice teachers to realise the influence of their actions on students, prompting reflective thinking of the experience. According to Lee (2005), the stages of the process of reflective thinking do not indicate progress toward the solution of the problem, but rather the degree of awareness of the situation where process and progress are viewed together. Farrell (2016) noted that reflective practices by teachers will result in increased teaching awareness, which will in turn encourage self-assessment and self-evaluation. All these introspective processes can result in preservice teachers becoming more motivated, proficient, and effective in the classroom (Lindroth, 2015).

Method

This study employed a structural equation modelling (SEM) approach to analyse the relationships among the five constructs. Data were gathered from preservice teachers in Malaysia.

Measures

The five constructs: lifelong learning skills (LLS), self-assessment ability (SA), self-belief (SB), teaching awareness (TA) and reflective thinking (RT) were assessed using a questionnaire that was subsequently called the *Reflective Thinking of Teachers Questionnaire* (RTTQ). Demographic data was also collected with the questionnaire. A 5 on the scale indicates Strongly agree, 4 Agree, 3 Neutral, 2 Disagree and 1 Strongly disagree. It was decided to allow the neutral response choice to remain because the inclusion of this option would allow it to have better psychometric coherence when the items were considered as a whole and it would have little effect on the overall reliability and validity (Dassa et al., 1997). This study was interested in the firm convictions of preservice teachers about reflective thinking and the neutral option represented a conviction which according to Dassa et al. (1997) was different from a 'no opinion' and a 'don't know'. Guidelines on the general features of a questionnaire as recommended by Siniscalco and Auriat (2005) were closely followed. Normal procedures for SEM analysis were applied in this study. The data were screened for outliers and missing data. Then convergent and discriminant validities of the data were established. The scale items of the questionnaire are as shown in the Appendix. It comprised two sections, the first requiring participants to provide demographic information and the second contained 28 statements on the five constructs.

Participants

One thousand and seventy preservice teachers from a teaching university in Malaysia participated in this study. These preservice teachers had prior teaching experience before they enrolled in bachelor degree programs in four specialised areas: science, business, social science, and languages. The sample consisted of 585 females and 485 males, with average age 24.50 years (Table 1).

Table 1: Demographic information of the participants (N=1070)

Variable		Number	%
Gender	Female	585	54.7
	Male	485	45.3
Average age	24.50 yrs		
Average years of teaching experience	3.46 yrs		
Areas of teaching specialisation	Science	355	33.2
	Business	155	14.5
	Social science	268	25.1
	Languages	292	27.2

It must be noted that the average teaching experience of the preservice teachers was 3.46 years. This arose because some of the respondents had been contract teachers employed by Malaysian schools prior to enrolling for their bachelor degree programs with the University, whilst other respondents had just returned from a six-month teaching placement in local schools.

Data collection

Ethics approval was obtained before the RTTQ was administered. The participants were informed about the purpose of this study and were told that they could withdraw from the study at any time during or after the study. Participation was voluntary and involved no payments in money or kind. Cases of missing data were removed from the study.

Results

Descriptive statistics

The descriptive statistics of the constructs are shown in Table 2. All the means are above the midpoint of 3.00 indicating that the respondents agreed with the items. The standard deviations indicate a narrow spread around the mean and skewness. The kurtosis indices reflect an acceptable range of normality. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy index was 0.93, and the Bartlett's test of sphericity was significant, $\chi^2 = 13630.45$, $p < 0.0001$, indicating that the sample and correlation matrix were within an acceptable range for analysis (Pallant, 2011; Hair, Black, Babin & Anderson, 2013).

Table 2: Descriptive statistics

Construct	Item	Mean	Std. dev.	Skewness	Kurtosis
LLS - lifelong learning skills	8	3.74	.68	-.88	1.50
SA - self-assessment ability	7	3.72	.56	-.53	.92
SB - self-belief	4	3.50	.69	-.35	.34
TA - teaching awareness	5	3.73	.60	-.52	1.07
RT - reflective thinking	5	3.25	.77	-.12	.16

Metric invariance

The metric invariance of the RTTQ was carried out using the females (N=585) and males (N=485) preservice teachers in the sample. The baseline model where all the factor loadings were freely estimated was specified and the values of CFI (.91), RMSEA (.041) and SRMR (.051) showed that the model fitted the data adequately. Based on the baseline model, the invariant model was specified where all the factor loadings across the two groups of preservice teachers were constrained to be equal. The values of the invariant model fit the data adequately well, with CFI (.90), RMSEA (.040), and SRMR (.054). The corrected chi-square difference test, $\Delta\chi^2(33, N=1070) = 40.82$, $p > .05$ indicates that the invariant model had a similar fit to the baseline model, indicating the metric invariance of the RTTQ was supported, and suggesting that the latent constructs are equivalent across

groups. Table 3 shows the summarised results of model-fit data for the two models examined for metric invariance.

Table 3: Summarised results of model-fit data for metric invariance

Model	χ^2	df	CFI	RMSEA Estimate	90% LO	90% HI	SRMR
Baseline model. Loadings freely estimated	2011.019	728	0.91	0.041	0.039	0.043	0.051
Invariant model. Factor loadings invariant	2051.842	761	0.90	0.040	0.038	0.042	0.054

Convergent validity

Hair et al. (2013) recommended that that convergent validity can be assessed using: (1) the average variance extracted, (2) the factor loadings and (3) the reliability of each construct. On factor loadings, an item reliability of 0.50 and higher was recommended (Hair et al., 2013). In this study, the factor loadings of all the items ranged from 0.54 to 0.81 (Table 4), demonstrating the validity of all the items. At the construct level, a Cronbach alpha of 0.70 and higher was recommended to reflect adequate reliability (Tavakol & Dennick, 2011). As shown in Table 4, all the constructs had composite reliabilities ranging from 0.72 to 0.87. It must be noted that the AVE for three constructs, SA, SB and TA, were 0.45, 0.45 and 0.40 respectively, but the composite reliabilities for each were above 0.60, which still showed adequate convergent validity (Fornell & Larcker, 1981). In addition, correlations among the factors ranged from 0.041 to 0.694, indicating that multicollinearity will not be an issue for the model (see Table 5). The convergent validity shown in Table 5 for the proposed constructs of the measurement model is adequate.

Discriminant validity

Hair et al. (2013) defined discriminant validity as "the extent to which a construct is truly distinct from other constructs…" (p. 606). They recommended that AVE estimates for two factors should be greater than the root means square of the correlation between the two factors. If the square root of the AVEs was greater than the other elements in the correlation matrix, this indicated that the constructs were more strongly correlated with its indicators than with the other constructs in the model. Table 5 shows the square roots of the AVE in the diagonal. Discriminant validity was established for all the constructs at both the item and construct levels; hence the constructs in the proposed model are deemed to be adequate for further analyses.

AMOS 20.0 was used to test the model fit of the research model for this study. The literature recommended using several fit indices to measure model fit (Bentler & Bonnet 1980; Bentler 1990; Browne & Cudeck, 1993). Hair et al. (2010) classified fit indices into absolute fit indices, incremental fit indices and parsimony fit indices. Absolute fit indices provide the basic assessment of the fit of the sample data to the measurement model and

Table 4: Results of the measurement model

Construct	Item	Factor loadings	Cronbach's alpha (> 0.70)[a]	Composite reliability (>0.60)[a]	Average variance extracted (>.50)[a]	Results
LLS	LLS1	.67	.87	.88	.54	Achieved
	LLS2	.69				
	LLS3	.68				
	LLS4	.71				
	LLS5	.70				
	LLS6	.71				
	LLS7	.67				
	LLS8	.69				
SA	SA1	.61	.80	.78	.45	Marginal
	SA2	.63				
	SA3	.58				
	SA4	.57				
	SA5	.63				
	SA6	.64				
	SA7	.56				
SB	SB1	.67	.72	.73	.45	Marginal
	SB2	.71				
	SB3	.61				
	SB4	.55				
TA	TA1	.64	.75	.74	.40	Marginal
	TA2	.62				
	TA3	.63				
	TA4	.54				
	TA5	.56				
RT	RT1	.58	.85	.85	.53	Achieved
	RT2	.67				
	RT3	.81				
	RT4	.80				
	RT5	.76				

a. Indicates an acceptable level of reliability or validity.
Fit indices: χ^2/df = 4.48, RMSEA = 0.57, GFI = 0.90, CFI = 0.91, TLI = 0.90

Table 5: Discriminant validity for the measurement model

	LLS	SA	SB	TA	RT
LLS	(.74)				
SA	.673**	(.67)			
SB	.334**	.441**	(.67)		
TA	.594**	.694**	.398**	(.63)	
RT	-.014	.062*	.401**	.170**	(.73)

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).
Diagonal in parenthesis are the square roots of the AVE extracted from observed variables.

indices commonly used are the chi square (χ^2), the goodness-of-fit (GIF) and the root mean square error of approximation (RMSEA). The incremental fit indices access how well the estimated model fits other alternative baseline models and the most commonly used incremental fit indices are the adjusted goodness of fit index (AGFI), comparative fit index (CFI), and the Tucker-Lewis index (TLI). The parsimony fit index provides information on which model among a set of competing models is best, considering its fit relative to its complexity and is determined by the ratio of χ^2 with the degrees of freedom (df). A ratio on the order of 5:1 or less is associated with better fitting models. In this study all the fit indices mentioned were used and summarised in Table 6. The result of the model fit as shown by the various fit indices show that the research model has a good fit.

Table 6: Indices for the research model

Model fit index	Values		Recommended guidelines*
	Initial measurement model	Final structural model	
χ^2	1642.66	1172.27	
χ^2/df	4.48	3.84	< 50
RMSEA	0.57	0.52	< .08
GFI	0.91	0.92	> 0.90
AGFI	0.90	0.90	> 0.90
CFI	0.91	0.92	> 0.90
TLI	0.90	0.91	> 0.90
IFI	0.90	0.92	> 0.90

* Hair et al. (2013); Bentler (1990)

Hypothesis testing

The results showed that four of the five hypotheses were supported by the data. Lifelong learning skills (β = -.13, C.R. = -1.86, p = .06 < .05) did not have a significant relationship with reflective thinking. However, self-assessment ability (β = -.94, C.R. = -3.75, p = .00 <.05), self-belief (β = .61, C.R. = 8.55, p = .00 < .05), and teaching awareness (β = .72, C.R. = 3.92, p = .00 < .05) had a significant relationship with reflective thinking. Table 7 shows the hypothesis testing results.

Table 7: Results for hypotheses

Hypotheses	Estimate	C.R.	P value	Result
H1 LLS will have a significant relationship with RT.	-0.13	-1.86	0.06	Not supported
H2 SA will have a significant relationship with RT.	-0.94	-3.75	<0.01	Supported
H3 SB will have a significant relationship with RT.	0.61	8.55	<0.01	Supported
H4 TA will have a significant relationship with RT.	0.72	3.92	<0.01	Supported

Discussion

This study examined the factors that influenced reflective thinking among Malaysian preservice teachers. The results show that reflective thinking had significant relationships with three of the four hypotheses, namely self-assessment ability, self-belief, and teaching awareness. It is estimated that these predictors of reflective thinking explained 33.3% of its variance. The error variance of reflective thinking is approximately 66.7% of the variance of reflective thinking itself. Hence, further research is needed to refine the scale for the measurement.

Reflective thinking had a significant relationship with self-assessment ability. Self-assessment in this study is defined as the ability to discover and assess the strengths and weaknesses of one self. This construct consisted of items on using feedback from students and classroom experiences to reflect on their teaching practices. Similarly Barnhart and van Es (2015) also found in their study on reflective practices among teachers that the framing of instructional interactions by putting them into context for their students will aid in enhancing this form of thinking, because they are able to assess with greater ease what they had done in the classroom. This seems to be similar to the findings of Barromi Perlman (2016), Lindroth (2015) and Clara (2015), self-assessment enables preservice teachers to be reflective of their practices in the classrooms, and this can enhance the learning experiences of their students. In the Malaysian context, self-assessment is crucial with the implementation of the MEB (2013). This blueprint advocates the development of students who are knowledgeable and able to think critically and creatively. This implies that preservice teachers must develop these skills in themselves as well. Hence, self-assessment is crucial for developing these skills.

Self-belief had a significant relationship with reflective thinking. Self-belief in this study is defined as how preservice teachers viewed themselves in relation to their students and their ability to teach. The items in the construct were focused on the preservice teachers' perceptions of themselves and how they view experiences and events that took place during their teaching. Hence, this finding supports research by Pfitzner-Eden (2016) that when preservice teachers experienced teaching in the classroom, there was a significant change in their perceptions and self-efficacy beliefs, if they had been given an opportunity to reflect on their practices in the classroom. When preservice teachers are given opportunities to reflect on their teaching practices, it may influence their teaching skills. In Malaysia, preservice teachers who lack mastery experience in teaching skills lack self-belief when teaching in the classroom (Wong, 2007). Hence, the development of self-belief through self-reflection is important.

Teaching awareness had a significant relationship with reflective thinking. Teaching awareness is defined as the ability of teachers to realise the influence their actions have on students. The items in this construct were focused on their teaching practices, personal values, and perceptions of the students they teach. This supports research by Farrell (2016), who found that preservice teachers became more aware of their assumptions, values, and beliefs when they were allowed to reflect on their teaching practices. Similarly Lindh and Thorgren (2016) found that reflective thinking must be preceded by an awareness of the event or experiences that has occurred, resulting in an awareness of emotions and thought about the event or experience. One of the aims of the MEB is to create awareness among Malaysian teachers of the needs of students. Hence, preservice teachers need to have a certain level of awareness in order to assess students' needs. Reflective thinking is fundamental to facilitate this.

Lifelong learning skills had an insignificant relationship with reflective thinking. Lifelong learning skills in this study are defined as the ability to carry out continuous assessment and evaluations of teaching strategies and the influences they have on student learning. The items in this construct focused on reflecting on their students and the work they carried out in the classroom. The results from this study, at least, suggest that these preservice teachers were not adept in reflecting on their teaching skills. Thinking about their teaching strategies requires a degree of in depth knowledge of themselves as teachers, as well as who they are as individuals. This lack may be due to the tendency for preservice teachers to be surface and strategic thinkers, as opposed to being deep thinkers (Ismail et al, 2013), and the continued use of learning approaches commonly practised at the secondary school level, which are predominantly characterised as memorising and repeating procedures for the purpose of examinations. The stresses, tight schedules and deadlines expected of them in the schools, at home and when they are attending classes at university (Sedhu & Choy, 2016) may also explain their lack of attention to reflecting on teaching strategies.

Implications for practice

This study makes several contributions to research into reflective thinking practices. The findings from using the RTTQ show that reflective thinking is related to self-efficacy, self-awareness and self-assessment. This is supported by other research on reflective teaching (Lindh & Thorgren, 2016; Pfitzner-Eden, 2016; Farrell, 2016). Reflection makes teachers aware of their own thought patterns, as well as emotional and behavioural reactions in different kinds of situations. Hence it can set in motion changes in the teaching practices of Malaysian teachers, to set higher goals and improve their quality.

The research model in this study suggests that the ability to self-reflect is crucial for the development of confidence and competence among teachers. For this sample of teachers at least, reflective thinking leads to self-efficacy, self-assessment and teaching awareness, all of which are traits of competent teachers (Lindh & Thorgren, 2016). Our data, however, do not show how teachers develop these traits, hence it will be necessary for future studies to investigate the factors that influence the development of such reflective traits.

Limitations and future studies

It must be noted that the data were collected only from preservice teachers of one country, that is, Malaysia. Although the sample size exceeded that recommended by Krejcie and Morgan (1970), self-reported instruments were used and thus the truthfulness of the respondents cannot be assured. Attempts have also been made in the current study to avoid seeing the perceptions of preservice teachers in the current study as trait like entities. Hence, it is expected that these teachers will exhibit different perceptions when the context changes in their surrounding environment.

This study suggests some directions for future research. The mechanism underlying reflective thinking was not explored. The questionnaire could be further expanded to include metacognitive skills, which are thought to also influence and impact reflective thinking. Another important question that needs answering is whether there are more identifiable traits for reflective and non-reflective preservice teachers. Added to this, the influence of non-reflective preservice teachers on their students' learning also needs exploring. As this study was limited to a cohort of Asian preservice teachers from one country, more insights on reflective thinking may be gained if this study is extended to include preservice teachers from other countries and contexts.

Conclusion

The findings of this study have shown that reflective thinking among Malaysian preservice teachers is significantly influenced by self-belief, teaching awareness, and self-assessment ability. However, this study was not able to explore the development of such reflective practices among these preservice teachers. This study is also limited in that it sampled only preservice teachers from one country, hence the generalisability of such relationships to preservice teachers from other countries is limited. Future studies could explore a comparative approach to include preservice teachers from other countries and contexts.

References

Barnhart, T. & van Es, E. (2015). Studying teacher noticing: Examining the relationship among pre-service science teachers' ability to attend, analyze and respond to student thinking. *Teaching and Teacher Education*, 45, 83-93. http://dx.doi.org/10.1016/j.tate.2014.09.005

Barromi Perlman, E. (2016). Using visual reflective diaries of school buildings as a tool for empowering students in teacher training. *International Journal of Qualitative Methods*, 15(1), 1-15. http://dx.doi.org/10.1177/1609406916653760

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238-246. http://psycnet.apa.org/doi/10.1037/0033-2909.107.2.238

Bentler, P. M. & Bonnet, D. C. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), 588-606. http://psycnet.apa.org/doi/10.1037/0033-2909.88.3.588

Black, S. (2005). Teaching students to think critically. *The Education Digest*, 70(6), 42-47.

Brookfield, S. D. (1995). *Becoming a critically reflective teacher*. London: Jossey-Bass.

Browne, M. W. & Cudeck, R. (1993). Alternative ways of accessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Beverley Hills, CA: SAGE.

Burbank, M., Ramirez, L. & Bates, A. (2012). Critically reflective thinking in urban teacher education: A comparative case study of two participants' experiences as content area teachers. *The Professional Educator*, 36(2), 1-17. https://eric.ed.gov/?id=EJ988205

Chesnut, S. R. & Burley, H. (2015). Self-efficacy as a predictor of commitment to the teaching profession: A meta-analysis. *Educational Research Review*, 15, 1-16. http://dx.doi.org/10.1016/j.edurev.2015.02.001

Choy, S. C. & Cheah, P. K. (2009). Teacher perceptions of critical thinking among students and its influence on higher education. *International Journal of Teaching and Learning in Higher Education*, 20(2), 198-206. https://eric.ed.gov/?id=EJ864337

Choy, S. C. & Oo, P. S. (2012). Reflective thinking and teaching practices: A precursor for incorporating critical thinking into the classroom? *International Journal of Instruction*, 5(1), 167-182. https://eric.ed.gov/?id=ED529110

Clara, M. (2015). What is reflection? Looking for clarity in an ambiguous notion. *Journal of Teacher Education*, 66(3) 261-271. http://dx.doi.org/10.1177/0022487114552028

Coulson, M., Torrance, S. & Nunn, S. (2007). Fostering reflective thinking with the Learning Achievement Self-Evaluation Record (LASER). *Psychology Learning and Teaching*, 6(1), 12-19. http://dx.doi.org/10.2304%2Fplat.2007.6.1.12

Dassa, C., Lambert, J., Blais, R., Potvin, D. & Gauthier, N. (1997). Effects of a neutral answer choice on the reliability and validity of attitude and opinion items. *The Canadian Journal of Program Evaluation*, 12(2), 61-80. http://evaluationcanada.ca/secure/12-2-061.pdf

Dewey, J. (1910). *How we think*. Boston: D. C. Heath and Co.

Dewey, J. (1963). *Education and experience*. New York: Collier Books.

DeWitt, D., Alias, N. & Siraj, S. (2016). Problem solving strategies of Malaysian secondary school teachers. In *Educational technology to improve quality and access of education to prosperous society*. (pp. 1-14). Bali: Universitas Negeri Jakarta. http://eprints.um.edu.my/16330/1/ETWC-2016_paper_199_(1).pdf

Eby, J. W. & Kujawa, E. (1994). *Reflective planning, teaching, and evaluation*. New York: Macmillan.

Farrell, S. C. (2016). The practices of encouraging TESOL teachers to engage in reflective practices: An appraisal of recent research contributions. *Language Teaching Research*, 20(2), 223-247. http://dx.doi.org/10.1177/1362168815617335

Felton, M. K. & Kuhn, D. (2007). "How do I know?" The epistemological roots of critical thinking. *Journal of Museum Education*, 32(2), 101-110. http://dx.doi.org/10.1080/10598650.2007.11510562

Fornell, C. & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50. http://www.jstor.org/stable/3151312

Gur Sahin, G. & Dikkartin Ovez, F. T. (2012). An investigation of prospective teachers' reflective thinking tendency. *Procedia - Social and Behavioral Sciences*, 55, 568-574. http://dx.doi.org/10.1016/j.sbspro.2012.09.538

Hayden, H. E. & Chiu, M. M. (2015). Reflective teaching via a problem exploration-teaching adaptations-resolution cycle: A mixed methods study of preservice teachers'

reflective notes. *Journal of Mixed Methods Research*, 9(2), 133-153.
http://dx.doi.org/10.1177/1558689813509027

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E. & Tatham, R. L. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Pearson Education.

Hair, J. F., Black, W. C., Babin, B. J. & Anderson, R. E. (2013). *Multivariate data analysis*. New York: Pearson.

Hamilton, S. J. (2005). Development in reflective thinking. [viewed 26 March 2015, not found 14 March 2917] http://www.reap.ac.uk/reap07/portals/2/csl/trydy%20banta

Ismail, H., Hassan, A., Muhamad, M. M., Ali, W. & Konting, M. M. (2013). Epistemological belief and learning approaches of students in higher institutions of learning in Malaysia. *International Journal of Instruction*, 6(1), 139-150. https://eric.ed.gov/?id=ED539902

Kuhn, D. (2016). A role for reasoning in a dialogic approach to critical thinking. *Topoi: An International Review of Philosophy*. Advance online publication. http://dx.doi.org/10.1007/s11245-016-9373-4

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607-610. http://dx.doi.org/10.1177/001316447003000308

Lee, H. J. (2005). Understanding and assessing preservice teachers' reflective thinking. *Teaching and Teacher Education*, 21(6), 699-715. http://dx.doi.org/10.1016/j.tate.2005.05.007

Lindh, I. & Thorgren, S. (2016). Critical event recognition: An extended view of reflective learning. *Management Learning*, 47(5), 525-542. http://dx.doi.org/10.1177/1350507615618600

Lindroth, J. T. (2015). Reflective journals: A review of the literature. *Update: Applications of Research in Music Education*, 34(1), 66-72. http://dx.doi.org/10.1177/8755123314548046

Ministry of Education Malaysia (2015). *Malaysia Education Blueprint 2015-2025 (Higher Education)*. Putrajaya: Ministry of Education Malaysia. https://www.um.edu.my/docs/default-source/about-um_document/media-centre/um-magazine/4-executive-summary-pppm-2015-2025.pdf?sfvrsn=4

Ord, K. & Nuttall, J. (2016). Bodies of knowledge: The concept of embodiment as an alternative to theory/practice debates in the preparation of teachers. *Teaching and Teacher Education*, 60, 355-362. http://dx.doi.org/10.1016/j.tate.2016.05.019

Osterman, K. F. (1990). Reflective practice: A new agenda for education. *Education and Urban Society*, 22(2), 133-152. http://dx.doi.org/10.1177/0013124590022002002

Osterman, K. F. & Kottkamp, R. B. (1993). *Reflective practice for educators*. London: Corwin Press.

Pallant, J. (2011). *SPSS survival manual*. London: Allen and Unwin.

Peters, R. A. (2015). Anchored learning and the development of creative, critical thinking, and life-long learning skills. *Teaching Public Administration*, 33(3) 221-240. http://dx.doi.org/10.1177/0144739415581077

Pfitzner-Eden, F. (2016). I feel less confident so I quit? Do true changes in teacher self-efficacy predict changes in preservice teachers' intention to quit their teaching degree? *Teaching and Teacher Education*, 55, 240-254. http://dx.doi.org/10.1016/j.tate.2016.01.018

Rodgers, C. (2002). Defining reflection: Another look at John Dewey and reflective thinking. *Teachers College Record*, 104(4), 842-866. https://www.tcrecord.org/content.asp?contentid=10890

Roessger, K. M. (2014). The effects of reflective activities on skill adaptation in a work-related instrumental learning setting. *Adult Education Quarterly*, 64(4), 323-344. http://dx.doi.org/10.1177/0741713614539992

Schon, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions*. San Francisco: Jossey-Bass.

Sedhu, D. S. & Choy, S. C. (2016). Perceptions of stress among female teachers enrolled in postgraduate programmes in a Malaysian university. *TARC International Conference on Learning and Teaching* (pp. 1-4). Kuala Lumpur: Tunku Abdul Rahman University College. https://www.researchgate.net/publication/313672411_Title_Perceptions_Of_Stress_Among_Female_Teachers_Enrolled_In_Postgraduate_Programmes_in_a_Malaysian_University_Introduction_In_order_for_career_advancement

Siniscalco, M. T. & Auriat, N. (2005). Questionnaire design. In K. N. Ross (Ed.), *Quantitative research methods in educational planning* (pp. 1-92). Paris: UNESCO. http://unesdoc.unesco.org/images/0021/002145/214555E.pdf

Sparks-Langer, G. M. & Colton, B. (1991). Synthesis of research on teachers' reflective thinking. *Educational Leadership*, 3, 37-44. https://pdfs.semanticscholar.org/0861/39a0f373df9688107e2e26347daa8de8f700.pdf

Tavakol, M. & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, 2, 53-55. https://dx.doi.org/10.5116/ijme.4dfb.8dfd

Williams, M. & Burden, R. L. (1997). *Psychology for language learners*. London: Cambridge University Press.

Wong, K. W. (2007). Sources of influence on teacher self-efficacy among preservice teachers. Paper presented at the Seminar Penyelidikan Pendidikan Institut Perguruan [Seminar on Teachers' Institute Educational Research], Batu Lintang, Malaysia. http://www.ipbl.edu.my/portal/penyelidikan/seminarpapers/2007/Edpsychology/wongannaIPIPfp.pdf

Appendix: Reflective thinking of teachers questionnaire

Scale type		Item
Lifelong learning skill (LLS)	LLS1	Students learn very differently from when I was in school, I need to look into new strategies to better deliver my lessons so that I can remain relevant now as well as in the future.
	LLS2	Whenever I am faced with a mistake that I have made I try to make corrections and learn from my experience and then use it to move forward.
	LLS3	I try to reflect on what I do during my lessons so that I can enrich the strategies I use with new and more effective ones. Sometimes I can get inspiration by talking to my colleagues from other fields.
	LLS4	I know how I present my classes will influence how my students will behave towards the subject. Every time I present a class I need to be cognizant that I need to reflect on how I have taught and make changes the next time if necessary.
	LLS5	I always think that what and how I did during my lesson is an important indicator of my effectiveness.
	LLS6	I like to take into consideration my past performance and integrate it with what I

		am doing in the present to help me better prepare for the future.
	LLS7	I know I am still learning to be a better teacher and the feedback I get from students and supervisors could be helpful in improving my future performance.
	LLS8	I know I have my strengths and weaknesses and teaching is a difficult job to carry out. I need to constantly look at my practices in order to be more effective with my lessons.
Self-assess-ment ability (SA)	SA1	I always think of what I had done during my lessons so that I can further improve on it.
	SA2	I am always interested in self-discovery so that I can apply the knowledge on how I do things and perhaps hone myself to be a better teacher.
	SA3	I know in a lesson there are many areas, like content and context that can make or break a lesson.
	SA4	I generally get good comments from students so I think I am doing quite well overall as a teacher.
	SA5	I feel that students' feedback is important as this would give me an indicator of the areas of my strengths and weaknesses.
	SA6	I think students' feedback are important as it will help me understand them better.
	SA7	I know I make assumptions about a lot of things and when others give me their opinions about how I am teaching I must put it into perspective. After all I can learn from all the feedback I get.
Self-belief (SB)	SB1	I believe that I need to take care of my own needs first before I can take care of other people's needs.
	SB2	I always try to look for areas of connectivity between what and how I teach with my life experiences.
	SB3	As a teacher I know that the mistakes I make can have an influence on the lives of my students.
	SB4	I feel very anxious about feedback given to me by students, it is as though they are evaluating and judging me as a person.
Teaching awareness (TA)	TA1	I try to think of what I teach my students in terms of my own area of discipline so as to enhance my lesson.
	TA2	I know that I am learning about my profession all the time and I have already a set of practices which I am comfortable with, although the feedback I get from students and my supervisor will help me improve those practices even more.
	TA3	I am aware of my beliefs and know that these beliefs will influence my behaviour toward myself and others.
	TA4	I know that what I believe about myself and others will ultimately control my behaviour.
Reflective thinking (RT)	RT1	I have a certain way of delivering my lessons that I am comfortable with, I do not know why I do it the way I do it. I just do.
	RT2	I know what I am doing as a teacher and I do not spend much time reflecting on my practices.
	RT3	When students give me feedback I do not give it much consideration because I feel that it is just their opinions anyway. I do not worry about it as long as I feel I am doing my job.
	RT4	Sometimes the feedback I get from my students and supervisor are so confusing I do not know what to make of them, I do not think it is actually going to help me learn anything about the way I conduct my lessons.
	RT5	I know I make mistakes but sometimes I feel I cannot do anything about it.

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