Reflective Thinking among Teachers: Development and Preliminary Validation of Reflective Thinking for Teachers Questionnaire

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This article describes the development and validation of the 32-item Reflective Thinking for Teachers Questionnaire (RTTQ) designed to assess the process of reflective thinking among teachers. The process of instrument development and validation is described, along with a review of relevant literature related to the process of reflective thinking. An exploratory factor analysis and a subsequent confirmatory factor analysis of the responses of a large sample (N = 659) was carried out. The results of the study showed that the structural equation model developed fitted the questionnaire data well. The confirmatory factor analysis produced goodness of fit indices within an acceptable range, and the questionnaire appeared to be a reliable instrument that would assist in the assessment and improvement of the quality of reflective thinking among teachers.

Cet article décrit le développement et la validation du questionnaire à 32 questions portant sur l'évaluation des compétences de la pensée critique chez les enseignants (Reflective Thinking for Teachers Questionnaire). Nous décrivons le processus d'élaboration et de validation du questionnaire, et présentons un examen de la littérature sur la pensée réflexive. Les réponses d'un échantillon de taille importante (N = 659) ont été soumises à une analyse factorielle exploratoire suivie d'une analyse factorielle confirmatoire. Les résultats indiquent que le modèle d'équation structurelle élaboré s'ajuste bien aux données du questionnaire. L'analyse factorielle confirmatoire a produit des valeurs élevées pour la qualité d'ajustement se situant dans une fourchette acceptable, et le questionnaire semble avoir été un outil fiable pour appuyer l'évaluation et l'amélioration de la qualité de la pensée réflexive chez les enseignants.

Reflective thinking and the role it plays in stimulating critical thinking is currently at the forefront of many of recent research studies (Bell et al., 2011; Burbank, Ramirez, & Bates, 2012; Campoy, 2010; Choy & Oo, 2012; Kember et al, 2000; Pagano & Roselle, 2009; Smerci, 2007). One of the main reasons for the interest in reflective thinking is because of the ability of individuals to reflect on their experiences, which is a fundamental skill necessary for learning and decision making (Bell et al., 2011). Developing students' ability to do reflective thinking has been the essential goal for learning and transformation in higher education. Hence, it is crucial for teachers to carry out reflective thinking themselves and eventually become a model to their

students, demonstrating the process of such thinking. However, research by Black (2005), Choy and Cheah (2009), and Choy and Oo (2012) has shown that teachers themselves often do not know how to be reflective or demonstrate reflective thinking.

While there are many ways of evaluating reflective thinking among teachers, from using reflective journals to document their experiences when teaching (Hubbs & Brand, 2010; Sedhu, Lee, & Choy, 2013), to classroom observations and interviews (Lee, 2005), such methods—although rigorous and thorough—are time consuming and do not provide feedback to teachers until the data collected can be analyzed. Hence, an instrument that provides quick yet useful information that helps teachers gain insight into how they teach can be valuable for self-reflection. A search of the existing literature did not yield reports on the development of a self-reporting type questionnaire that was created specifically to assess reflective thinking in teachers; that is, except for one designed by Choy and Oo (2012) that was not validated. Kember et al. (2000) had developed and validated an instrument to measure levels of reflective thinking; however, it is more suitable for use with students than teachers in higher education contexts. This article reports on the further development of the Reflective Thinking for Teachers Questionnaire (Choy & Oo, 2012) and its validation for use with teachers in higher education. Before further discussion of the questionnaire, a definition of reflective thinking is needed.

Definition and Character of the Reflective Thinking Process

Many attempts have been made by various researchers to present a comprehensive definition of reflective thinking. It has been defined as a reflective process (Dewey, 1933; Lee 2000), a thinking approach (Cox, 2005; Gagatsis & Patronis, 1990; Schon, 1987), and a thinking model (Eby & Kujawa, 1994), wherein the latter included the need to think of the moral implications of one's actions. Rodgers (2002) explained reflective thinking as consisting of four criteria: firstly, as a meaning-making process; secondly, as a rigorous way of thinking; thirdly, as an interactive activity; and lastly, as a set of attitudes. Even though researchers have adopted various definitions of reflective thinking in their studies, an analysis of them revealed certain general themes for defining and assessing its quality. More specifically, the procedure of reflection needs to include some systematic analysis of the problem or event. Moreover, it is necessary to emphasize the cyclical nature of the reflective thinking process and the recursive character of the criteria involved.

According to Lee (2005), practitioners begin reflection when there is a problem that cannot be resolved or when they wish to reconsider an educational situation or a conclusion they have previously reached. These practitioners will engage in reflection in order to understand the nature of teaching, as well as their personal values and beliefs. Consequently, the stages of reflective thinking need not indicate the progress toward a solution; rather, it can signify the degree of awareness of the situation where the process and progress are viewed together. Cox (2005) further notes that reflection forms a bridge between a course of study and personal experience creating a highly individual and very motivating learning activity.

Learning and Reflective Thinking: Theoretical Framework

Learning is a process that involves the reconstruction of experience; it takes into consideration an individual's participation while working in a different environment with the reflection about the experience and context (Pagano & Roselle, 2009). Teachers actively seek to enhance critical

thinking and problem-solving skills by encouraging students' reflection of their learning experience and discussing of key issues. Reflection is a process of helping students to take a step back to look at their experience, to put it in context, and derive meaning from it. The idea of reflection as a key for the successful transformation of learning into knowledge was introduced by Dewey (1963) in his book, *Experience and Education*. Dewey stressed the importance of allowing students to reflect on their experiences as a means of expanding their minds. Students' reflections—often written as a form of journals, guided questionnaires, diaries, and papers—have long been used to promote thinking (Pagano & Roselle, 2009). However, helping students "externalize" the process from inside their heads to the outside world is the job of teachers. Williams and Burden (1997) noted that it is important whether teachers think of themselves as disseminators of information or mediators of learning because mediators will empower students by modelling relevant and effective strategies for them to reflect and learn on their own.

Reflective learning consists of three elements: a cognitive component, critical thinking, and narrative inquiry (Sparks-Langer & Colton, 1991). The cognitive element focuses on how a teacher uses reflection to enhance their knowledge in planning and decision making. It consists of six parts: content knowledge, pedagogical knowledge, curriculum, characteristics of learners, teaching contexts, and lifelong educational goals. The last two parts, teaching contexts and lifelong learning, according to Sparks-Langer and Colton (1991) lacked in-depth study. Building from that in later years, Buehl and Fives (2009) explained lifelong learning for teachers as life experiences which is acquired while still students in a classroom. Dinkleman (1999) on the other hand suggested that lifelong learning for teachers can be in the form of self-study where it serves a dual purpose of promoting reflective teaching and personal growth. According to Dinkleman, the critical thinking element involves the analysis of a situation in a classroom and making inferences about it in order to decide on the possible effects solutions will have on the situation. The third element, narrative inquiry, is the process of allowing the voices of teachers (Williams & Burden, 1997) to be heard which allows them to share the context from which decisions have been made in order to gain a deeper understanding of their experiences. Following the same lines of thought as Sparks-Langer and Colton, Hamilton (2005) developed a rubric for reflective learning (Table 1) based on a model consisting of three areas of development: these capacities are the educator's ability to self-access, awareness of their own teaching skills, and developing life-long learning skills.

Choy, and Oo (2012) subsequently developed a questionnaire to assess the reflective thinking of teachers with an area added for belief about the self and self-efficacy. The extra part was added because teachers are highly influenced by their beliefs (Williams & Burden, 1997); as such, self-efficacy is a better predictor of how teachers behave in the classroom when other factors influencing their behaviour are controlled (Pajares, 1995).

Method

Even with the stages of reflective thinking clearly defined, Lee (2005) pointed out that attempting to find a reliable and accurate measure has been difficult. Therefore, three criteria guided the development of the questionnaire in our study. Firstly, the questionnaire needed to be short so that production would be economical and allow for frequent administration. The instrument was expected to provide quick and useful information to teachers on their reflective thinking practices. It would also provide information to supervisors of pre-service teachers for enhancing training experiences. Secondly, the items needed to reflect the various areas of

Table 1

Development in Reflective Thinking

Areas of Development	Examples
Ability to self-assess	Demonstrates understanding
• Observing own performance	Uses feedback
• Using feedback	Narrates process (did this, did that)
• Finding and analysing patterns	Probes own work
• Making judgements	
Awareness of own teaching skills	Uses feedback and past performance to plan future learning
• Concepts and misconceptions	
• Knowledge construction	Understands own learning and transfers it to multiple contexts.
• Metacognition	
Developing lifelong learning skills	Questions personal assumptions
• Developing identity as a learner	Sees own identity as a learner and uses internalised construction of effectiveness
• Transferring learning to other contexts	Questions assumptions and awareness of multiple perspective
• Understands learning as a lifelong process	

Adapted from Hamilton (2005)

development in reflective thinking, similar to the rubrics developed by Hamilton (2005) with items added for belief about self and self-efficacy. Thirdly, a high degree of reliability that showed relevance to teachers' reflective thinking processes had to be established (Cohen, Manion, & Morrison, 2000; Mason 1996) for each of the areas in the instrument.

The preliminary measure of the reflective thinking for teachers questionnaire consisted of 33 items from the Questionnaire for Reflective Thinking for Teachers designed by Choy and Oo (2012); however, the validity and reliability of the instrument was not established, only an analysis of the frequency count and response patterns was reported and discussed. The process of development and validation of the instrument will follow. The items were used with permission from the authors. No changes were made to the original items or the 5-point Likert Scale. A 5 on the scale indicates Strongly agree, 4 Agree, 3 Neutral, 2 Disagree, and 1 Strongly disagree. We decided to keep the neutral response choice 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, Lambert, Blais, Potvin, & Gauthier, 1997). This study was interested in the firm convictions teachers had about reflective thinking, and the neutral option represented a conviction which, according to Dassa et al., was different from "no opinion" and "don't know" responses. Guidelines on the general features of a questionnaire as recommended by Siniscalco and Auriat (2005) were closely followed in our research design.

The questionnaire was given to five academic staff of a university who were not taking part in the research. They were asked to highlight any linguistic ambiguities on the questionnaire; items they identified as lacking clarity we then modified. This new instrument was called the Reflective Thinking for Teachers Questionnaire (RTTQ).

Questionnaire Validation

The draft version of the RTTQ was field tested with a sample of 142 practicing teachers from two secondary schools in Malaysia from which 139 valid responses were obtained. Of the total respondents, 90% were female and 10% were male. Among the sample, 42% of them had 1-5 years of teaching experience, 27% had 6-10 years, 19% had 11-15 years, and 12% had more than 16 years. All the respondents completed the questionnaire in English and as a paper and pencil exercise.

The informed consent of all the respondents was obtained prior to administration of the questionnaire and they were assured of confidentiality and anonymity. They were also told that they could withdraw from the study at any time. The data was obtained from the respondents on a voluntary basis. It was emphasized to the respondents that there were no right or wrong answers, and that the researchers were only interested in an accurate appraisal of the reflective thinking that took place among teachers. The participants were encouraged to comment on any of the items that were unclear to them.

An exploratory factor analysis (see Results section for details) was conducted on the field test, which resulted in a shorter, revised version of the RTTQ that was submitted for a confirmatory factor analysis. The second administration of the questionnaire took place with another sample of teachers from another higher institution of learning in Malaysia.

The second administration of the questionnaire took place with a sample of 600 practicing teachers from ten schools in Malaysia; 520 valid responses were returned. The respondents consisted of 241 male and 279 female teachers. 96.2% of the respondents had up to five years of teaching experience, while 3.8% had six or more years of experience. All the respondents completed the questionnaire in English as a paper and pencil exercise.

Results

Exploratory Factor Analysis

An investigation of the RTTQ factor structure was conducted using SPSS (version 16) to determine whether there was empirical support for separate factors pertaining to reflective thinking among teachers, and to identify any items that might be removed from the questionnaire. Before conducting the EFA, two indicators were tested for sample appropriateness for such an analysis. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy index was .88, and the Bartlett's Test of Sphericity was significant $\chi^2= 2251.13$, $p < .001$; this indicated the sample and correlation matrix were within an acceptable range for analysis.

The principal component analysis (PCA) was carried out on the 33 items of the first version of the RTTQ to estimate the maximum number of factors that would be of interest. PCA was used here because it uses sums of the observed variables to optimally weight the maximal variability and reliability of the resultant factor solution (Floyd & Widaman, 1995). An initial estimate of the number of factor was provided by using eigenvalues greater than one (Kaiser's criterion) which indicated support for an eight-factor solution. However, since an eight-factor solution would not be parsimonious or meaningful, the scree test of eigenvalues plotted against factor was completed instead. This examination suggested that only three to four factors should

be retained. A parallel analysis using the Monte Carlo PCA program (Watkins, 2000) to compare the size of eigenvalues obtained from a randomly generated data set of the same size was then carried out. The results suggest four factors should be retained. Parallel analysis was used because it provides an accurate indicator of the number of factors to be retained and helped to distinguish important factors from trivial ones (Ledesma &Valero-Mora, 2007).

Principal-axis factor analysis (PFA) was chosen from among the methods of common extraction with Equamax rotation with Kaiser Normalisation, which minimized the number of variables that loaded highly on a factor and the number of factors needed to explain a variable resulting in a simple structure within variables. The 33 items then underwent two PFA runs specifying three and four factors. The trial PFA run with three factors suggested that one of the factors contained items that could be separated into another factor. The following run with a four-factor solution met the goals of interpretability for this study.

The four-factor solution was then examined for the presence of unsatisfactory items. A factor loading of 0.4 was used as used as the cut off point for variable acceptance. The items were also evaluated for complex factor loadings as well as factors that did not load significantly with other factors. There was only one item that had a factor loading lower than 0.4 and did not load significantly with other factors; thus, that item was deleted and none of the items had complex loadings. Using an iterative process, the remaining 32 items underwent another PFA analysis again using Equamax rotation which also yielded four factors. The items were once more re-evaluated for any observed low factor loadings and complex factor loadings. As there was little change to the number of items, the KMO of the final analysis remained at 0.88.

All of the four factors were clearly identifiable along the areas of development in reflective thinking (Hamilton, 2005) shown on Table 2: these were developing lifelong learning skills (Factor 1), ability to self-assess (Factor 2), awareness of own teaching skills (Factor 4), and belief about self and self-efficacy (Factor 3), an area added by Choy and Oo (2012). The rotated factor patterns are shown in Table 2. The total variance explained by the four factors was 52.6% with the Factor 1 accounting for 32.45%, Factor 2 accounting for 10.3%, Factor 3 accounting for 5.5%, and Factor 4 accounting for 4.4% correlations among the four factors. Internal consistencies (Cronbach's alphas) were calculated for each of the multi-item RTTQ factors based on the responses of the participants. Internal reliability ranged from 0.81 for belief about self and self-efficacy to 0.92 for developing lifelong learning skills. The correlations between the factors as well as Cronbach's alpha reliabilities between each scale are shown in Table 3.

Confirmatory Factor Analysis

A confirmatory analysis was conducted based on data collected from the second sample using AMOS (Version 20). Based on the result of the EFA, we hypothesized a four-factor model of lifelong learning, ability to self-assess, belief and self-efficacy, and awareness of own teaching skills. These factors were also hypothesized to covary with each other. In the examination of the goodness-of-fit for the four-factor model (χ^2= 960.24, df = 311, p< .001), the final exploratory analysis showed that there might be a statistical basis for rejecting the solution in favour of one with one less factor. As a result, the four-factor baseline model was compared with a three- and a five-factor model. The three-factor model specified lifelong learning, ability to self-assess, and a factor where belief and learning awareness were combined together. The five-factor model specified lifelong learning, belief, awareness of how one learns, self-discovery, and self-assessment, but the model could not be specified with AMOS. Hence, we investigated the three-

and four-factor models further.

Before proceeding with the analysis of the two models, the assumptions of multivariate normality and linearity were evaluated through SPSS. The Skewness value of - .29 and the Kurtosis value of 1.42 were within the criteria for normal distribution (Hair, Black, Babin, Anderson, & Tatham, 2006). For this reason, we used all of the data we collected.

Table 2

Loading for the four factor model after exploratory factor analysis (EFA) and confirmatory factor analysis (CFA)

Item Content	EFA				CFA			
	Developing lifelong learning skills	Ability to self-assess	Belief about self and self-efficacy	Awareness of own teaching skills	Developing lifelong learning skills	Ability to self-assess	Belief about self and self-efficacy	Awareness of own teaching skills
Lifelong 1	.71	.25	.20	-.16	.78			
Lifelong 2	.70	.38	.19	-.15	.80			
Lifelong 3	.70	.29	.14	-.49	.73			
Lifelong 4	.69	.28	.30	-.15	.73			
Lifelong 5	.66	.29	.22	-.05	.75			
Lifelong 6	.66	.33	.21	-.91	.74			
Lifelong 7	.63	.39	.32	-.23	.79			
Lifelong 8	.60	.38	.26	-.03	.77			
Self Assess 1	.30	.76	-.50	.31		.57		
Self Assess 2	.33	.74	.16	-.14		.50		
Self Assess 3	.29	.70	.17	-.06		.57		
Self Assess 4	.36	.50	.15	-.16		.53		
Self Assess 5	.38	.49	.28	.13		.46		
Self Assess 6	.44	.44	.34	.05		.47		
Self Assess 7	.40	.58	.29	-.08		.48		
Self Assess 8	.34	.58	.32	-.15		.54		
Self Assess 9	.28	.50	.06	-.06		.57		
Self Assess 10	.15	.42	-.13	-.11		.61		
Self Assess 11	-.26	.40	.32	.09		.67		
Self Assess 12	.17	.68	.21	.27		.54		
Self Assess 13	.14	.62	.04	-.05		.63		
Belief 1	.01	-.58	.62	.06			.72	
Belief 2	.22	.37	.53	.27			.84	
Belief 3	.39	.39	.41	-.31			.73	
Belief 4	.14	.25	.40	-.11			.70	
Awareness 1	.16	-.17	-.28	.68				.65
Awareness 2	-.25	-.54	.20	.55				.46
Awareness 3	.12	-.34	.14	.55				.71
Awareness 4	-.18	.16	.29	.54				.78
Awareness 5	-.38	-.09	.07	.54				.84
Awareness 6	-.22	-.18	.41	.52				.86
Awareness 7	-.33	.38	.13	.46				.81

Table 3

RTTQ Factor correlation for the Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA)

Factor	EFA				CFA			
	1	2	3	4	1	2	3	4
1 Lifelong	.92				1			
2 Self-Assess	.55	.85			.48	1		
3 Belief	.56	.56	.81		.01	.18	1	
4 Awareness	-.19	-.03	.10	.85	-.21	-.16	.32	1

Note. Cronbach's alphas for EFA are presented on diagonal

Table 4

Summary of the fit indices for the proposed models

Model	df	χ^2	χ^2/df	p	GFI	CFI	TLI	RMSEA
Three Factor Correlated	402	1682.90	4.19	0	.84	.84	.81	.078
Four Factor Correlated	311	960.24	3.08	0	.93	.93	.93	.048

In order to compare the goodness-of-fit for the two models, maximum likelihood estimation, a technique commonly conducted for confirmatory factor analysis (Pallant, 2011), was used since there were no universally accepted set of criterion to prove model fit (Kline, 2011). That is why several widely accepted goodness-of-fit indexes were computed, as shown in Table 4. The χ^2 statistic was not used in the evaluation of model fit, because it is known to be strongly dependent on sample size. The five main criteria used to assess model fit were as follows. First was Bentler's (1990) comparative fit index CFI, a non-normed index that incorporates correlation for complexity. Second was the Tucker and Lewis index TLI, an index that resolves negative bias issues and will evaluate parsimonious fit index (McDonald & Marsh, 1990). Third was the goodness of fit index, or GFI, which shows the amount of variance that is accounted for by the model (Hooper, Coughlan, & Mullen 2008). The fourth was the root mean square error approximation, (RMSEA). The ratio of χ^2 to the degrees of freedom *df*, (χ^2/df), a statistical value which reduces the impact of sample size, was the final gauge we used. Models with a CFI and TLI greater than .90 are considered acceptable; however, the RMSEA value is expected to have an upper limit of .07 (Hooper at al., 2008) as this shows good model fit.

The comparison between the two models showed that the four-factor model exhibited a better overall fit, RMSEA = .048, than the three-factor model. The other indices also indicated that the four-factor model was a better overall model of the two in comparison. Based on the overall fit indices, the four-factor model was selected as the model of choice for our study. Table 2 shows the loadings for the four-factor model after EFA and CFA.

An examination of the standardized solution of the four-factor model indicated that correlations among the factor ranged from .01 to .48, with the respondent's ability to self-assess and developing lifelong learning skills showed the strongest relationship, *r* = .48. In contrast, belief about self and self-efficacy and developing lifelong learning skills had the weakest relationship, *r* = .01.

Discussion

This study described the development and validation of a questionnaire designed to assess the reflective thinking process carried out by teachers. An exploratory and a confirmatory factor analysis was conducted with two relatively large samples of practicing teachers in order to demonstrate the strength of a four-factor model underlying the RTTQ: developing lifelong learning skills, ability to self-assess, belief about self and self-efficacy and awareness of the respondent's own teaching skills.

Relationship between the Factors and the Reflective Thinking Process

The first factor (developing lifelong learning skills) denotes a group of items that assesses the willingness of teachers to embrace lifelong learning of the skills required for their jobs. It determines if teachers are willing to learn from their mistakes and move on. This factor has eight items on learning that is pursued post-compulsory education and involving others in a working team in order to foster continued growth. These items represent the lifelong learning in the education scenario where teachers are expected to self-study (Dinkleman, 1999) and reflect on their experiences interacting in the classroom (Buehl & Fives, 2009).

The second factor (ability to self-assess) represents items that are oriented toward assessing the critical thinking and analysis that teachers carry out on their performance in the classroom. This process involves reflecting on their performance and forming judgements on it (Sparks-Langer & Colton, 1991). The 13 items in this factor include handling student and peer feedback, reflecting on opinions of others, and assumptions of others and situations.

The third factor (belief about self and self-efficacy) characterizes beliefs about self and others that could influence teacher behaviour in the classroom (Williams & Burden, 1997). The four items in this factor include beliefs about self and others, openness to learning from mistakes, and feelings towards self and others.

Finally, the fourth factor (awareness of own teaching skills) signifies items that probe into teaching skills and the awareness of how the skills are used. The seven items in this factor investigates the awareness and reactions toward classroom situations, students and peers. These items are focused on concepts, misconceptions, and the awareness of how learning occurs in multiple contexts. Some of the items in this factor are stated negatively to encourage the respondents to think of their own teaching practices. This factor also assesses the sharing of experiences among peers, involving narrative inquiry (Sparks-Langer & Colton, 1991).

Potential Uses for the RTTQ

The results obtained from the RTTQ responses are useful for teachers, teacher educators, and researchers. First, teachers—especially novice teachers—can use the RTTQ for self-assessment purposes to determine their current level of reflective thinking and to chart their development of this form of thinking over time. In the latter, the RTTQ can be particularly useful to positively influence teachers' attitudes and their perceptions of students, peers, and superiors so that they become skilled practitioners of teaching who continuously self-regulate effective teaching processes. Presently, an accompanying score sheet with interpretation rubrics (Mertler, 2001) does not exist, but will be designed in the near future.

Second, teacher educators can use the RTTQ as a diagnostic or consciousness-raising tool in a similar manner in which teachers use the questionnaire for self-assessment purposes. Teacher educators can administer the questionnaire to a group of pre-service teachers and evaluate the degree of self-reflection that takes place during their teaching practicum or at a specific point during their teaching experience. Discussions on the process of reflection using a teaching journal together with the RTTQ can further enhance the process of reflection with these teachers. It is often assumed that teachers will eventually learn to reflect as a result of the nature of their work; however, research has shown that this does not readily occur (Black, 2005; Choy & Cheah, 2009; Choy & Oo, 2012). The RTTQ can therefore help encourage and initiate this reflective process in new teachers.

Finally, researchers can use the RTTQ as a research tool to chart the development and progress of reflective thinking among pre- and in- service teachers. The responses of these teachers on the RTTQ can be correlated to their reflective journals to give further insight on the development of reflective thinking. Although correlations are not causal, the RTTQ will give an indication of the relationship between teaching experiences and the development of reflective thinking. Additionally, the RTTQ will also give insight into how teachers are modelling reflective thinking. In sum, the data obtained from the RTTQ can be used to monitor pre-service teacher in regulating the processes underlying the practice of reflective thinking.

Conclusion

This article has described the development and validation of a self-report questionnaire to assess reflective thinking among teachers. Although the RTTQ was demonstrated to have robust psychometric properties as a measure of reflective thinking in teachers, it still remains a self-reporting instrument. As with all self-reporting instruments, the RTTQ should be considered as one source of information about the current level of reflective thinking occurring among teachers. Nevertheless, using the RTTQ can enable and empower teachers, especially novice teachers, to become self-regulated reflective thinkers who can better capitalize on their interactions with peers and students as well as their experiences in the classroom. By increasing their awareness of the reflective process, teachers can learn to become better reflectors and facilitators, which ultimately, will enable them to become more effective and efficient in their classrooms.

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Appendix: Reflective Thinking for Teachers Questionnaire

Scale type	Item					
Develop lifelong learning skill	1. 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.	1	2	3	4	5
	2. 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	1	2	3	4	5
	3. 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.	1	2	3	4	5
	4. 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.	1	2	3	4	5
	5. I always think that what and how I did during my lesson is an important indicator of my effectiveness.	1	2	3	4	5
	6. 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.	1	2	3	4	5
	7. 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.	1	2	3	4	5
	8. 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.	1	2	3	4	5
Ability to self-assess	9. I always think of what I had done during my lessons so that I can further improve on it.	1	2	3	4	5
	10. 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.	1	2	3	4	5
	11. I know in a lesson there are many areas, like content and context that can make or break a lesson.	1	2	3	4	5
	12. I generally get good comments from students so I think I am doing quite well overall as a teacher.	1	2	3	4	5
	13. I feel that students' feedback is important as this would give me an indicator of the areas of my strengths and weaknesses.	1	2	3	4	5
	14. I think it is important that I take students' feedback into consideration as that will help me improve what I am doing now so that I will perform better in future.	1	2	3	4	5
	15. I think students' feedback are important as it will help me understand them better.	1	2	3	4	5
	16. I know that all feedback are just opinions of others about me. There must be some truth in what they see, if not they will not make them. I need to weigh the feedback I get against some of the opinions and assumptions I have about myself.	1	2	3	4	5
	17. 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.	1	2	3	4	5
	18. I try to think of what I teach my students in terms of my own area of discipline so as to enhance my lesson.	1	2	3	4	5
	19. 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.	1	2	3	4	5

Scale type	Item					
	20. I am aware of my beliefs and know that these beliefs will influence my behaviour toward myself and others.	1	2	3	4	5
	21. I know that what I believe about myself and others will ultimately control my behaviour.	1	2	3	4	5
Belief about self and self-efficacy	22. I believe that I need to take care of my own needs first before I can take care of other people's needs	1	2	3	4	5
	23. I always try to look for areas of connectivity between what and how I teach with my life experiences.	1	2	3	4	5
	24. As a teacher I know that the mistakes I make can have an influence on the lives of my students.	1	2	3	4	5
	25. I feel very anxious about feedback given to me by students, it is as though they are evaluating and judging me as a person.	1	2	3	4	5
Awareness of how one teaches	26. I tend to follow orders rather than be innovative because I do not want to get in trouble with my supervisor.	1	2	3	4	5
	27. I am only interested in getting my assigned classes done properly, I basically do not have the time or interest in talking to my colleagues about their strategies and goals for their classes.	1	2	3	4	5
	28. 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.	1	2	3	4	5
	29. I know what I am doing as a teacher and I do not spend much time reflecting on my practices.	1	2	3	4	5
	30. 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	1	2	3	4	5
	31. 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.	1	2	3	4	5
	32. I know I make mistakes but sometimes I feel I cannot do anything about it.	1	2	3	4	5