

Science Teachers' Reflective Practices: Perspectives and Attitudes

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ABSTRACT Studies investigating reflective practices among teachers have focused on reflective practice use in teaching and teacher's professional development. The attitudes of teachers toward reflective practices have been neglected, but the attitudes of science teachers toward reflective practices are key to their effective use in classroom settings. This study aimed to understand the attitude of science teachers toward these practices and how they implement professional reflective practices as well as any relationship between reflective practices and attitudes. A sample of 650 science teachers, 321 males and 329 females completed the questionnaire. Results revealed that science teachers practiced all reflective activities at high levels. Additionally, their attitudes toward reflective practices were moderately positive. Pearson correlation coefficients for the relationship between the reflective practices and attitudes of science teachers were statistically significant at $p < 0.01$. Hence, science teachers who had positive attitudes toward reflective practices were likely to demonstrate more reflective teaching in their educational careers.

INTRODUCTION

Teachers are the most effective agents of educational change. Therefore, they must recognize every aspect related to their profession, such as the background, skills, learning preferences, and motivation of their students and how to develop these aspects, for them to effectively play their role in the classroom context and then improve the learning outcomes of their students. Reflection in teaching and learning lies in encouraging teachers to view problems from different standpoints. In addition, Mathew et al. (2017) argued that the use of reflective practices by teachers may facilitate teaching processes, learning, and understanding because reflective practices allow teachers to conduct systematic inquiry into themselves. Accordingly, they understand themselves, their practices, and their students; thus, it can play a central role in the professional development of teachers. When teachers probe their own actions and experiences frequently, their self-professional develop-

ment will be more effective. Reflective teaching can also link learning to behaviors, where science teachers can develop their self-awareness level and hence their performance with reflective thinking to create the right environment for PDs and professional growth (Owen et al. 2020; Procter 2020).

According to the arguments above, focusing attention on reflective practices is crucial. To do this, Abdulsalam (2009) suggested that the preparation of science teachers be directed toward the development of their thinking in general and reflective thinking in particular and then reflective practices. Global trends in teacher preparation emphasize the need to prepare teachers who are capable of reflecting on and analyzing their professional practices. Abu-Sultan and Abu-Askar (2017) indicated that training teachers on reflective practices might contribute to professional growth by developing their abilities to innovate their teaching practices, engage in self-learning, and conduct research. In addition, Race (2014) and Lyons (2010) asserted that

the ultimate objective of education must be to develop the reflective thinking and practices of teachers. This is because reflective thinking is considered one of the most important teaching tools as it enables instructors to plan, monitor, and evaluate each step in the decision-making process, which positively affects teacher and student performances (Almasri 2017; Procter 2020).

Dewey (1910) first presented the concept of reflection in the early 20th century. He described reflective practice as the ability to think about work to engage in the learning process. Dewey (1910) also highlighted that the main rationale for reflective practice is that the experience of an individual does not necessarily lead to learning, rather one must think about the experience to learn. Furthermore, he added that teachers must practice this process in a social context and in an environment in which learning takes place. According to Day (1999), the ideas of science teachers must be tested through teaching practices. Studies have suggested that this can be done only through reflection, which should lead to multiple perspectives about the educational process (Gheith and Aljaberi 2018; Shaheen 2012).

Three approaches have been identified to understand intellectual reflection: the first is the cognitive approach, which includes studies on the information assimilation and decision-making of science teachers. The second is the critical approach, which has its roots in moral and ethical thinking. The third approach is the narrative input, which indicates that teachers tell their own stories by framing the problem using natural investigation and case studies (Sparks-Langer 1992). The nature of intellectual reflection varies according to its relation to procedural action. Schon (1983) identified two kinds of reflective practices with respect to the time of reflection: reflection on action (simultaneous reflection) and reflection on procedure (post-action reflection). These two types have been the source of the recognition of divergent intellectual reflection types and levels.

Although the conception of intellectual reflection of Schon (1983) is generally accepted, it is also subject to criticism. For instance, reflection on action is strongly criticized because it is difficult to practice in a short period of time (Eraut 1995). Reflection on procedure is easy to control

because it focuses on increasing teaching efficiency in terms of measurable gains in a narrow subject matter with identified goals. However, reflection on procedure does not address the emotional and professional dimensions of teaching, which are primary motivators affecting teacher quality, interest, and commitment (Day 1999).

Reflective practice in the teaching profession is described as a process of problem-solving, rebuilding meaning, and evaluating while participating in new activities (Reiman 1999; Eick and Dias 2005; Cavanagh 2015). According to this description, reflecting on new practices leads to learning and cognitive growth (Pertel et al. 2020). The absence of reflection means that teachers have relied on routine teaching. Al-Ahmad (2003) affirmed that the reflective practices of teachers is the ability to think before, during, and after learning to evaluate instructional effectiveness with respect to the classroom needs and core concerns of students. She assumed that cognitive growth occurred through a connected curriculum. Thus, by engaging in instructional teaching, the ability of science teachers to analyze what they are doing and to rebuild their professional plans and knowledge is revealed. They also select, evaluate, and adapt instructional strategies that best suit student needs (Reiman 1999).

In the area of teacher education, studies focusing on the levels of intellectual reflection are usually categorized in the same way (Hatton and Smith 1994; Wellington and Austin 1996; Ghaye and Ghaye 1999). For instance, McIntyre (1993) studied the nature of intellectual reflection in the Oxford University Teacher Education Program, which is a framework for the distinct levels of intellectual reflection. McIntyre (1993: 39–52) further emphasized three levels of student teacher intellectual reflection:

Technology: focuses on achieving goals effectively

Practice: focuses on assumptions, pre-orientation, values, and actions

Liberalization: focuses on broader ethical, social, and political issues, including institutional and community forces that may restrict the freedom of action of an individual or limit the effectiveness of his actions.

Studies (Ahmed 2009; Al-Mazroue 2006) have emphasized the contribution of reflective practices to improve the instructional performances,

observational skills, and attitudes of teachers toward professional growth and have validated that reflective teaching leads to a change in teaching behavior and to a better level of performance by clarifying, observing, and analyzing convictions and beliefs held by teachers toward their professional roles and responsibilities. In addition, studies (Ellison 2008; Shaheen 2012; Rayyan 2013; Cengiz and Karatas 2015) have confirmed that including reflective practices in academic training and PDs contributes to stimulating and supporting reflection processes, re-energizes practitioners, develops self-esteem and self-confidence and self-efficacy, generates self-awareness, and establishes supportive relationships among individuals integrated in reflective practices and learning through the experiences of others.

Researchers (Torff and Sessions 2008; Torff and Byrnes 2010) have studied the relationship between the attitudes of teachers and their PDs in various fields. They have also found that primary school teachers were supportive of professional growth than health education, physical education, social studies, and science teachers. The five groups (primary education, private education, mathematics, English, art, and music) were also more positive than science teachers were. The result indicated the need to design, develop, and evaluate innovative programs to improve their effectiveness and the attitudes of teachers toward PDs. Efe (2009) studied the effect of the attitudes of pre-service science teachers on reflective practices with a total of 206 students, 68 of whom were biologists, 49 physicists, 56 chemists, and 33 others. Results indicated that the attitudes of pre-service science teachers toward reflective practices differed with specialization and their years of study; no gender-based differences in reflective attitudes were found. Additionally, Gheith and Aljaberi (2018) investigated the reflective practice levels of teachers and their attitudes toward professional self-development. The results further verified that the reflective practices of teachers were within an "acceptable" level, but their practices in some categories were below acceptable. The results indicated positive attitudes by teachers toward professional development. Aldahmash et al. (2017) studied the views of teachers about their reflective practices and reflective teaching. Moreover, the results corroborated that teachers think that they practice reflective activities

at high levels. No differences were found due to gender and experiences regarding their views about the practices of reflective activities in the teaching profession.

The majority of studies related to reflective practices have focused on exploring the use and development of reflective practices. Attitudes toward reflective practice, which is essential to developing the skills of teachers to the level where it can be effectively applied in classrooms, were very rare. The researchers found that more studies are essential with regard to the reflective practices of science teachers, especially their attitudes toward reflective practice as this would help educators and educational policy makers plan for more effective PD programs for science teachers.

Objectives of the Study

The study aimed at fulfilling the following objectives:

1. To identify science teacher's implementation of the types of reflective practices.
2. To shed light on the attitudes of science teachers toward reflective practices.
3. To know the nature of the relationship between the science teachers and reflective practices and their attitudes toward them.

Purpose of the Study

According to the objectives of this study, it tries to uncover the relationship between reflective practices by science teachers and how teachers feel about these reflective activities. Accordingly, this study asks the following questions:

4. What types of reflective practices do science teachers use?
5. What are the attitudes of science teachers toward reflective practices?
6. What is the relationship between the reflective practices of science teachers and their attitudes toward them?

METHODOLOGY

This study employed a cross-sectional survey approach to investigate the reflective practices of science teachers in classrooms and their attitudes toward these practices. The collected data were also used to determine potential associations between the reflective practices and attitudes of science teachers.

Sample

The study participants were all secondary school science teachers in Hail and Hafr Al-batin in Saudi Arabia. The sample included 650 science teachers (321 males and 329 females). The range of science teaching experience among the participants was 1 to 30 years. These experiences were classified into the following levels: less than 5 years ($n = 186$), 5 to 10 years ($n = 307$), and more than 10 years ($n = 157$). With regard to education, 491 participants had a bachelor's degree, 123 participants had a diploma, five teachers had a master's degree, and 36 held a doctorate. As for the type of certificate (educational and non-educational), 543 participants had an educational qualification, and 107 qualifications were non-educational. The sample distribution according to specialization was as follows: physics ($n = 182$), chemistry ($n = 201$), and ($n = 267$).

Questionnaire

The baseline questionnaire that describes reflective practices (Celes 2010) was employed to gather information from science teachers. This questionnaire aimed to ascertain the views of the cross section of the teaching force in Saudi Arabia about implementing reflective practices through PDs and their attitudes about the use of reflective practice for future PDs. This specifically included the PDs they had undertaken over a period longer than the previous three years. It also surveyed the attitudes of science teachers toward reflective practices, and the original questionnaire was submitted for review to

11 experts in science education. Based on the feedback of experts, modifications were made to several items. The final questionnaire comprised 17 items in two domains: reflective practices of science teachers (seven items) and attitudes of teachers toward reflective practices (ten items).

Internal Consistency

The Pearson correlation coefficients were calculated to determine the consistency of each item within its respective domain (Table 1). Evidently, each questionnaire item was related to its respective domain with a statistical significance level of $\alpha \leq 0.01$ and had high or medium values, ranging from (0.613) and (0.711) for reflective practices and between (0.560) and (0.782) for reflective attitudes.

Researchers calculated the Cronbach alpha coefficient to determine the reliability of the questionnaire. The results shown in Table 2 confirm that the questionnaire is a reliable tool for collecting the data regarding the reflective practices and attitudes of science teachers.

Table 2: Reliability of the questionnaire items using Cronbach's alpha coefficient

Domain	# Items	Cronbach's alpha coefficient
Extent of reflective practice	7	0.811
Teachers' attitudes toward reflective practices	10	0.884
Total	17	0.872

Table 1: Pearson correlation coefficient for the internal consistency of the survey

Domain	Item	Correlation coefficient	Item	Correlation coefficient
Reflective practice	1	0.623**	5	0.667**
	2	0.644**	6	0.711**
	3	0.613**	7	0.705**
	4	0.687**		
Attitudes toward reflective practice	1	0.699**	6	0.782**
	2	0.762**	7	0.581**
	3	0.646**	8	0.688**
	4	0.761**	9	0.695**
	5	0.758**	10	0.560**

**Statistically significant at $\alpha \leq 0.01$.

Data Analysis and Interpretations

All the data were analyzed using the descriptive statistics of means and standard deviations. The Pearson correlation coefficient was also utilized to determine the relationship between reflection practices and attitudes. For the determination of the practice domain level and the attitude level of science teachers toward the reflective practice domain, a five-point scale was used as follows: very high (5), high (4), medium (3), low (2), and very low (1). The length of the category was calculated using the following equation to interpret the results: $[\text{length of the category} = (5-1)/5 = 0.80]$. Thus, the value ranges for levels are as follows: very high = 5-4.2, high = <4.2-3.40, medium = <3.40-2.60, low = <2.60-1.80, and very low = <1.80-1).

RESULTS

Three research questions were employed: the first one addressed the reflective practices of science teachers, the second question concerned the attitudes of science teachers toward reflective practices, and the third one examined the potential associations between the reflective practices and attitudes of science teachers.

Question I: What are the attitudes of science teachers toward reflective practices?

Table 3 shows the means and standard deviations for participant responses regarding their attitudes toward reflective practices. The means shown indicate that the attitudes of science

teachers toward reflective practices were moderately positive for six of ten items. Teachers believed that reflective practices were enjoyable, important, enhanced their work, understandable, and easy to do. Four items were negative. However, teachers rated them as high and medium. Item 6, which states that “reflective practice is frustrating” rated high, means that teachers are not convinced with the implementation of reflective practice in teaching. The same thing is true with item 2: reflective practice is pouring. Two items, namely, item 4 and item 8, were rated medium, which might indicate that the attitudes of teachers toward reflective practice are unsatisfactory.

Question II: What types of reflective practices are used by science teachers?

The first study question was answered by determining the teachers’ evaluation of their reflective practice. Table 4 presents the means and standard deviations for participant responses in the reflective practice domain. The results validate that for each of the seven types of reflective practices, the mean performance level for science teachers was 3.80, representing a high level of practice, with item means ranging between 3.64 and 4.05. All of these values represented high levels of practice, which means that the reflective practices of teachers were at high levels. The highest practice was “reflection after training” with a mean score of 4.05 and a high level of exercise, while the practice of “reflection after meeting parents” was less than 3.64 with a high level of practice as well.

Table 3: Attitude toward reflective practices: means, standard deviations, and rank

S. No.	Item	Mean	SD	Level	Rank
1	Reflective practice is fun.	3.93	0.980	High	1
2	Reflective practice is boring.	3.41	1.11	High	8
3	Reflective practice is understandable.	3.73	0.956	High	4
4	Reflective practice is confusing.	3.17	1.22	Medium	9
5	Reflective practice enhances successful actions.	3.83	1.18	High	3
6	Reflective practice is frustrating.	3.46	1.21	High	6
7	Reflective practice is easy.	3.42	1.03	High	7
8	Reflective practice is difficult.	3.12	1.12	Medium	10
9	Reflective practice is important.	3.85	1.13	High	2
10	Reflective practice is marginal.	3.57	1.02	High	5
Total		3.55	0.762	High	

(very high = 5-4.2, high = <4.2-3.40, medium = <3.40-2.60, low = <2.60-1.80, and very low = <1.80-1)

Table 4: Reflection practices means, standard deviations, and rank

S.No.	Items	Mean	SD	Level of practice	Rank
1	Practice reflection while writing a lesson plan.	3.89	.850	High	2
2	Practice reflection while doing the lesson.	3.78	.875	High	4
3	Practice reflection at the end of the lesson.	3.67	.916	High	5
4	Practice reflection at the end of teaching a unit or a chapter of the book.	3.65	.913	High	6
5	Practice reflection after visiting the supervisor or school principal.	3.87	.893	High	3
6	Practice reflection after meeting parents.	3.64	.996	High	7
7	Practice reflection after obtaining a training course.	4.05	.913	High	1
Total		3.80	.647	High	

Question 3: What is the relationship between the reflective practices of science teachers and their attitudes toward them?

The Pearson correlation coefficient was calculated to determine if there was a significant statistical association between the reflective practices of science teachers and their attitudes toward these practices.

The correlation coefficient between the reflective practices and the attitudes of science teachers was positive and statistically significant at 0.328 ($p < 0.01$).

DISCUSSION

The results indicated that the attitudes of science teachers toward reflective practices were moderately positive, where teachers believed that reflective practices were enjoyable, important, enhanced their work, understandable, and easy to do. However, teachers also believed that reflection practice was difficult, boring, and somehow confusing, where teachers rated four negative items as high and medium, which might indicate that the attitudes of teachers toward reflective practice is unsatisfactory. This also implies that educational policy makers should work more on the improvement of reflective practice and on stressing on the effectiveness of reflective practice in making the profession of teachers more productive. Aldahmash et al. (2017) recommended that the attitudes of teachers toward the use of reflective practice in teaching should be studied because they thought that attitude is an effective factor in motivating teachers to do certain practices related to teaching. Moreover, Efe (2009) affirmed that the attitudes of pre-ser-

vice teachers toward reflective practices are influenced by the whole discipline and by their years of study, but not affected by gender. Gheith and Aljaberi (2018) confirmed that the attitudes of teachers toward reflective practices are one of the most essential factors contributing to skill development, leading to the effective application of these practices in classrooms.

The results also corroborated that the level of reflective practices among science teachers was high. Researchers argued that if the level of reflective practice was high among science teachers, their classroom practices would be high, positive, and effective. In this regard, Aldahmash et al. (2017) proved that teachers with different genders and experiences think that they practice reflective activities at high levels. In addition, researchers (Almasri 2017; Ellison 2008; Procter 2020) indicated that the training of teachers on reflective practices increases their positive classroom practices, such as enjoying participatory integration, critical dialog, and curriculum development. This increased teacher engagement positively affects learner outcomes within classrooms. In this regard, studies (Pertel et al. 2020; Cengiz and Karatas 2015) stressed that school teachers believe that reflective activities positively affect their cognitive awareness, feelings, and motivations, which may encourage them to implement plans and choose appropriate strategies.

The correlation coefficient between the reflective practices and the attitudes of science teachers was positive and statistically significant, which indicates that science teachers with positive attitudes toward reflective practices show more reflective practices. This leads us to stress on the necessity of focusing on reflective practices and to enlighten science teachers

about the importance of reflective practices on the improvement of science teaching. Studies such as those by Efe (2009), Gheith and Aljaberi (2018) and Hendricks (2016), emphasized the correlations between attitudes and practices, indicating that positive beliefs and attitudes toward the reflective practices of professionals may drive these behaviors and that negative beliefs may be associated with less reflective practices.

CONCLUSION

This study aims to draw the attention of educators and educational researchers to reflective practices as an emerging pedagogical concept in the Kingdom of Saudi Arabia. A primary study purpose is to highlight the importance of developing favorable attitudes among science teachers toward reflective practices to improve classroom instructions and educational outcomes. The results show high levels of reflective practices among science teachers and moderate positive attitudes toward the use of reflective practices in science teaching. They also exhibit a significant correlation between the attitudes of teachers and their reflective practices. However, the results for the attitudes toward reflective practices reveal that teachers still think that reflective practice is still difficult to do and confusing. This implies that science teachers who had positive attitudes toward reflective practices were likely to demonstrate more reflective teaching in their educational careers. Furthermore, these results imply that science teachers are in need of more training on reflective practices to obtain very high levels of practice and to minimize the confusion regarding the use of reflective practices in teaching sciences.

RECOMMENDATIONS

Given the study results, the following recommendations are offered:

Researchers and other stakeholders should conduct further studies on reflective teaching practices at divergent stages of education. The conceptual framework on reflective teaching practices provided here could help teachers develop their instructional practices and provide supervisors with indicators to assess the instructional behaviors of science teachers. Curricu-

lum designers should attend the reflective practices of science teachers by including them in the development of pre-service training or continuing PD programs. Preparation and PD programs for science teachers should include information that highlights the impact of reflective practices on improving professional and classroom practices to further encourage positive attitudes toward reflective practices. Educational researchers should conduct further studies on the reflective thinking of science and math teachers in classrooms, and the reflective practice levels of science teachers should be tackled.

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REFERENCES

- Al-Ahmad N 2003. Experimenting the documentary bag in the teacher preparation program in Saudi Arabia and comparing its benefits and difficulties with similar programs in the developed countries. *Journal of Educational Sciences Cairo University*, 443: 22-47.
- Abdulsalam M 2009. *Teaching Science Preparing the Teacher and Integrating Theory and Practice*. Egypt: Arab Thought House.
- Abu-Sultan A, Abu-Askar M 2017. The reflective practices of science teachers in the upper basic stage in North Gaza governorate. *Journal of Palestine University for Research and Studies*, 71: 1-27.
- Ahmed FK 2009. The effectiveness of a proposed program of teaching based on structural theory to improve teaching performance and develop the trend towards professional growth among students of the Department of Home Economics. *Studies in Curriculum and Teaching Methods*, 1421: 60-99.
- Aldahmash AH, Alshmrani SM, Almufti AN 2017. Secondary school science teachers' views about their reflective practices. *Journal of Teacher Education for Sustainability*, 19: 43-53.
- Almasri TA 2017. A program based on thinking in the development of some of the teaching skills and the trend towards the profession of the student Diploma in Education Science. *Egyptian Journal of Scientific Education*, 206: 37-84.
- Al-Mazroue HM 2006. Peer Training: Vision in the Professional Growth of the Teacher. *The Thirteenth Annual Meeting Preparation and Development of the Teacher in the Light of Contemporary Variables*. King Saud University, Riyadh, 20-21 January 2006.
- Cavanagh NM 2015. Reflective Judgment: Can Problem-Based Learning Approach Make a Difference?

- Doctoral Dissertation. South Carolina, United States: University of South Carolina. From <<https://scholarcommons.sc.edu/etd/3665>> (Retrieved on 30 October 2020).
- Celes RR 2010. *Reflective Practice: The Teacher in the Mirror*. Doctoral Thesis, Unpublished. Las Vegas: Graduate College University of Nevada.
- Cengiz C, Karatas F 2015. Examining the effects of reflective journals on pre-service science teachers' general chemistry laboratory achievement. *Australian Journal of Teacher Education*, 40(10): 22-44.
- Day C 1999. Researching teaching through reflective practice. In: J Loughran (Ed.): *Researching Teaching: Methodologies and Practices for Understanding Pedagogy*. London: The Falmer Press, pp. 215-232.
- Dewey J 1910. *How We Think*. Boston: D. C. Heath and Company.
- Efe R 2009. Science student teachers' attitudes towards reflective practice: Differences in subjects and grades. *Cypriot Journal of Educational Sciences*, 4: 72-86.
- Eick C, Dias M 2005. Building the authority of experience in communities of practice: The development of pre-service teachers' practical knowledge through co-teaching in inquiry classrooms. *Science Teacher Education*, 89(3): 470-491.
- Ellison C 2008. Reflective make-and-take: A talent quest reflective practice teacher model. *Reflective Practice*, 9(2): 185-195.
- Eraut M 1995. Shon shock: A case for reframing reflection-in-action? Teachers and teaching. *Theory and Practice*, 11: 9-22.
- Ghaye A, Ghaye K 1999. *Teaching and Learning Through Critical Reflective Practice*. London: David Fulton.
- Gheith EM, Aljaberi NM 2018. Reflective teaching practices in teachers and their attitudes toward professional self-development. *The International Journal of Progressive Education*, 14: 161-180.
- Hatton N, Smith D 1995. Reflection in teacher education: Towards definition and implementation. *Teaching and Teacher Education*, 11(1): 33-49. [https://doi.org/10.1016/0742-051X\(94\)00012-U](https://doi.org/10.1016/0742-051X(94)00012-U)
- Hendricks C 2016. *Improving Schools Through Action Research: A Reflective Practice Approach*. 4th Edition. Paperback. Boston MA: Pearson Education Inc.
- Lyons N 2010. *Handbook of Reflection and Reflective Inquiry: Mapping a Way of Knowing for Professional Reflective Inquiry*. USA: Springer. <http://www.springer.com/gp/book/9780387857435>
- Mathew P, Prasanth M, Peechattu PJ 2017. Reflective practices: A means to teacher development. *Asia Pacific Journal of Contemporary Education and Communication Technology*, 3: 126-131.
- McIntyre D 1993. Theory theorizing and reflection in initial teacher education. In: J Colderhead, P Gates (Eds.): *Conceptualizing Reflection in Teacher Development*. London: The Falmer Press, pp. 39-52.
- Owen RL, Buckr JA, van Dam N 2020. Creating the conditions for reflective team practices: Examining sociocracy as a self-organizing governance model that promotes transformative learning. *Reflective Practice*, 1-18. <https://doi.org/10.1080/14623943.2020.1821630>
- Pertel N Le, Fisher J, van Dam N 2020. Neuroscience of embodied reflection: Somatic/mindbody/contemplative practices, health, and transformative learning. *Reflective Practice*, 1-16. <https://doi.org/10.1080/14623943.2020.1827492>.
- Procter L 2020. Fostering critically reflective thinking with first-year university students: early thoughts on implementing a reflective assessment task. *Reflective Practice*, 21(4): 444-457, DOI: 10.1080/14623943.2020.1773421
- Race P 2014. *Making Learning a Guide for Post-Compulsory Education*. 3rd Edition. London: SAGA Publication Ltd.
- Rayyan A 2013. The degree of reflective practices in mathematics teachers and their relation to teaching self-efficacy. *Al-Manara for Research and Studies*, 201: 141-170.
- Reiman AJ 1999. The evolution of the social role taking and guided reflection framework in teacher education: Recent theory and quantitative synthesis of research. *Teaching and Teacher Education*, 15: 597-612.
- Schon D 1983. *The Reflective Practitioner: How Professionals Think in Action*. New York: Basic Books.
- Shaheen MA 2012. The reality of the teaching practices of faculty members at Al - Quds Open University and their relation to their attitudes toward professional self - development in the light of some variables. *Al - Azhar University Journal*, 142: 181-208.
- Sparks-Langer G 1992. In the eye of the beholder: cognitive critical and narrative approaches to teacher reflection. In: L Valli (Ed.): *Reflective Teacher Education: Cases and Critiques*. New York: SUNY Press, pp. 147-160.
- Torff B, Byrnes K 2010. Differences across academic subjects in teachers' attitudes about professional development. *The Educational Forum*, 75(1): 26-36.
- Torff B, Sessions D 2008. Factors associated with teachers' attitudes about professional development. *Teacher Education Quarterly*, 35(2): 123-134.
- Wellington B, Austin P 1996. Orientations to reflective practice. *Educational Research*, 38(3): 307-316.

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