

باب التربية:

1 -The reflective thinking skills of mathematics and sciences of preservice teachers at the Lebanese University

مهارات التفكير في برنامج إعداد معلمي الرياضيات والعلوم في الجامعة اللبنانية



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مستخلص البحث:

في البرامج التعليمية لغالبية الجامعات حول العالم، يتم إيلاء اهتمام كبير لتعزيز التفكير أو التفكير في العمل كما هو الحال في كلية التربية في الجامعة اللبنانية. يهدف هذا البحث إلى التعرف على مستويات التفكير في برنامج إعداد معلمي الرياضيات والعلوم في الجامعة. تم إجراء مسح على معلمي ما قبل الخدمة في سنتهم الدراسية الثالثة والذين هم في الفصل الدراسي للتخرج وقد أنهوا موادّ دراسية تتطلب التفكير. تمّ استخدام استبانة التفكير التي طوّرها كيمبر وآخرون (2000) كأداة لجمع البيانات. وهي تتضمن 16 بنداً تقيس أربعة أنواع من التفكير: الفعل المعتاد والفهم والتفكير والتفكير النقدي. وقد تمّ استخدام الإحصاء الوصفي لتحليل البيانات. وأظهرت النتائج أنّ الفهم حصل على أعلى متوسط يليه التفكير النقدي والتفكير. من ناحية أخرى حصل الفعل المعتاد على أقلّ متوسط.

الكلمات المفتاحية: اعداد المعلمين، مهارات التفكر، الفعل المعتاد، الفهم، التفكر، التفكر النقدي

Abstract

At the education programs of the majority of universities around the world, a great attention is given to promoting reflective thinking or reflecting upon work which the case at the faculty of pedagogy at the Lebanese university. This research aims at exploring the reflective thinking levels of preservice mathematics and science teachers. A survey was conducted on third-year preservice teachers who are in their graduation semester and already attended courses in which reflection is required. ‘Reflective Thinking Questionnaire’ (RTQ), which was developed by Kember et al (2000) was used as data collection tool. It includes 16 items measuring four types of reflective thinking: Habitual Action (HA), Understanding (U), Reflection (R), Critical Reflection (CR). Descriptive statistics were used to analyze the data. The results showed that understanding (U) received the highest mean followed by critical reflection (CR) and reflection (R). On the other hand, habitual actions (HA) had the lowest average score.

Key words: preservice teachers, reflective thinking skills, habitual action, understanding, reflection, critical reflection

Introduction

“The notion of reflection nowadays is considered crucial in the field of teaching and teacher education” (Clara, 2015). Reflective practice is defined as the process of acquiring new insights about oneself and/or one’s practice by learning from and through experience (Boyd and Fales, 1983). It usually requires the practitioners to critically assess their work and become self-aware in order to acquire new understanding and enhance future practice.

Being a complex task, teaching is a profession that needs continuous self-reflection and the ability to adjust and manage specific situations in classroom settings. Teachers who were asked to reflect on their teaching declared that it was helpful in problem solving and problem resolution (Hayden & Chiu, 2015). Lindh & Thorgren, (2016) found that compared

to non-reflectors, those who are reflective about their work make fewer mistakes, are more critical of their work, and learn more from it. Therefore, it is evident to frequently find the word “reflection” in teacher education course descriptions. However, it is still somewhat of a buzzword, necessary but rarely fully understood to the point where it can be used “uncritically and unreflectively” (Griffiths 2000: 538). There is a lot of discussion about how to operationalize practices that offer opportunities for reflection, but not as much about what reflection is in and of itself. Student teachers are supposed to reflect on their practices during their practicum, they often do just that. As a result, they end their practicums uninformed about the subtle changes they actually underwent, and with the theory–practice divide remaining wide and unbroken. “Reflective practice should be taught explicitly because, in most cases, simply telling pre–service teachers to reflect on their experiences is not sufficient,” as Lane, McMaster, Adnum, and Cavanagh stated (2014: 482).

Preservice teachers at the Lebanese University enroll in several courses and practicums that require reflection (classroom observation, teaching practice I, II & III, and action research), however, it’s surprising how little attention has been paid to methods for determining whether and to what extent students engage in reflective thinking or for deciding if the objectives of these courses have been achieved.

Experts have created certain instruments to measure reflective thinking. For example, Kizilkaya and Askar (2009) developed the “Reflective Thinking Skill Scale Towards Problem Solving” (as cited in Tuncer and Ozeren, 2012). It consisted of 14 items and 3 subdimensions (Questioning, Evaluating, and Causation). Kember et al. (2000) developed a “Reflective Thinking Questionnaire” that consisted of 16 items and 4 sub–dimensions (Habitual Action, Understanding, Reflection, Critical Reflection). Another tool was the “Reflective Thinking Tendency Scale” (RTTS) developed by Semerci (2007) (as cited in Turan and Koc, 2019) for teachers and preservice teachers.

Open–mindedness, wholeheartedness, and responsibility are the three prerequisite attitudes that must exist in order for someone to become reflective (Dewey, 1933). Being open–minded is defined as having the

capacity to evaluate novel issues and concepts devoid of bias and a proactive willingness to hear multiple viewpoints in order to identify the even our most cherished beliefs are subject to error (Dewey, 1933, p. 30). Dewey's whole-heartedness, according to Goodman (1991), refers to an individual's inner strength and desire to be a reflective educator regardless of any personal cost. The last requirement, responsibility, is viewed more as a moral quality than an intellectual one. As stated by Dewey (1933), "considering the consequences of a projected step" and being willing to accept them when they make sense given a position already taken are aspects of intellectual responsibility. (Page 32). Inquiring into the motivations behind their actions, conscientious teachers constantly weigh the educational, psychological, and broader societal background and consequences of their actions in the classroom. They hold themselves accountable for the consequences for society at large in addition to the education of their students. Responsible answerable liable fully responsible take responsibility culpable. Adds Goodman (1991): Teachers who are intellectually responsible think through the implications.

Jack Mezirow's work (1991) offered a thorough, reasonable, and—above all—practicable framework for creating a method to evaluate reflective thinking, which helped create a protocol for determining the degree of reflection in journal writing.

Mezirow distinguishes between reflective and non-reflective behavior. He distinguished between three categories of non-reflective actions: introspection, thoughtful action, and habitual action. There were two stages to reflective action, with content and process reflection making up the lower, less critical stage. This terminology comes from Dewey (1933), who called more in-depth, deliberate, and profound reflection "critical reflection." Mezirow refers to premise reflection as the more critical type of reflection.

The distinction between content and process reflection was eliminated in favor of seeing the two as parts of a single reflective thinking scale in order to create a more practical tool. Although cultivating reflective thinking was acknowledged to have an affective component (Boud & Walker, 1993; Wong et al., 1995b), the instrument focused on evaluating results according to the degree of the demonstrated reflective thinking. The main

source of inspiration for the protocol developed by Kember et al. (1999) and used in this study was Mezirow (1991). The four constructs or scales of the instrument will be described by referencing Mezirow's work and providing evidence to support definitions.

Method

The participants of the present paper consist of fifty-six preservice mathematics and science teachers who have been enrolled in the three practicums (practice I, II, & III) and a two-module course (action research) at the teacher training program at the faculty of pedagogy, Lebanese University, in the 2022–2023 academic year.

The descriptive method was used to conduct the study. This study's main goal was to investigate the levels of reflective thinking among mathematics and science preservice teachers who already finished their practice courses. The total sampling method was used to determine the sample. There were 56 samples in total. The study's data consists of reflective thinking abilities. The data was gathered using the Reflective Thinking Questionnaire (RTQ), created by Kember et al. (2000). The 16 items measure four different types of reflective thinking: Habitual Action (HA), Understanding (U), Reflection (R), Critical Reflection (CR). The Likert type 5 scale is used to score the scale: Scale is scored according to Likert type 5. They were "definitely agree" = 5, "agree with reservation" = 4, "only to be used if a definite answer is not possible" = 3, "disagree with reservation" = 2, and "definitely disagree" = 1.

The questionnaire's validity and reliability were confirmed. Cronbach's alpha was used to estimate the questionnaire's reliability, and the result was 0.85. Data regarding the minimum, maximum, average, and standard deviation of each type of reflective thinking were analyzed using descriptive statistics.

Items 1,5,9,13 of the questionnaire refer to the first type of reflective thinking Habitual Action (HA), which is defined by the action that has been previously learned and, as a result of repeated use, becomes automatic or requires little conscious thought.

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1. When I am working on some activities, I can do them without thinking about what I am doing
 5. In this course we do things so many times that I started doing them without thinking about it.
 9. As long as I can remember handout material for examinations, I do not have to think too much.
 13. If I follow what the lecturer says, I do not have to think too much on this course
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Items 2,6,10,14 refer to Understanding (U) defined as the action that “makes use of existing knowledge, without attempting to appraise that knowledge, so learning remains within pre-existing meaning schemes and perspectives.” (Mezirow, 1991)

2. This course requires us to understand concepts taught by the lecturer.
 6. To pass this course you need to understand the content.
 10. I need to understand the material taught by the teacher in order to perform practical tasks
 14. In this course you have to continually think about the material you are being taught.
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Items 3,7,11,15 refer to Reflection (R) which is validity testing according to Mezirow (1991). “Reflection involves the critique of assumptions about the content or process of problem solving ... The critique of premises or presuppositions pertains to problem posing as distinct from problem solving. Problem posing involves making a taken-for-granted situation problematic, raising questions regarding its validity.” (Mezirow, 1991, p. 105)

3. I sometimes question the way others do something and try to think of a better way.
7. I like to think over what I have been doing and consider alternative ways of doing it.

11. I often reflect on my actions to see whether I could have improved on what I did.

15. I often re-appraise my experience so I can learn from it and improve for my next performance.

Items 4,8,12,16 refer to Critical Reflection (CR) which involves us becoming aware of why we perceive, think, feel or act as we do.

4. As a result of this course I have changed the way I look at myself.

8. This course has challenged some of my firmly held ideas.

12. As a result of this course I have changed my normal way of doing things

16. During this course I discovered faults in what I had previously believed to be right.

Higher education is the most common setting for development through the phases of reflective thinking (Kitchener & King, 1981). However, no single course appears to be linked to transitions between stages (Pascarella, 1999). A pupil could demonstrate reflective thinking in one area but not another, indicating that this ability does not appear and then inevitably extend over all domains (Mason, Boldrin, & Zurlo, 2006).

The ability, desire, and experiences that are specific to each individual determine the focus, pace, and direction of their own growth (Fischer & Pruyne, 2003). Thus, it is up to each individual to choose whether or not to make the effort necessary to develop and practice reflective thinking habits on a daily basis.

The following table shows the four levels for assessing habits of reflective thinking

Habitual action Understanding Reflection Critical reflection

 |----- requires metacognition-----
 (thinker considering his/her own thinking)
 |-----requires deep approaches to learning-----
 (Learner actively engaged and attempting to learn)

Habitual actions conducted without significant thought.	A deep approach to understanding the ideas in an attempt to absorb the author's underlying meaning but without relating ideas to personal life	Pro-active learner generalizes theory to practical applications, makes connections to other knowledge, and gains personal insight from knowledge	Non-hasty consideration of outcomes, values, and premise underlying the knowledge, often leading to a perspective shift
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Source: Kember and colleagues (2008).

Result

The findings obtained in Habitual Action (HA) of reflective thinking are presented in Table 1 below:

Table 1. Descriptive Statistic of Habitual Action (HA)

Scale	Min	Max	Mean	SD
1. When I am working on some activities, I can do them without thinking about what I am doing	7.00	14.00	4.6	0.78
5. In this course we do things so many times that I started doing them without thinking about it.	1.00	30.00	3.77	1.20
9. As long as I can remember handout material for examinations, I do not have to think too much.	4.00	19.00	3.42	1.18
13. If I follow what the lecturer says, I do not have to think too much on this course.	6.00	18.00	3.44	1.30

The findings obtained in Understanding (U) are presented in Table 2 below:

Table 2. Descriptive Statistic of the Understanding Factors of Reflective Thinking

Scale	Min	Max	Mean	SD
2. This course requires us to understand concepts taught by the lecturer	0.00	33.00	4.41	0.90
6. To pass this course you need to understand the content	1.00	45.00	4.68	0.78
10. I need to understand the material taught by the teacher in order to perform practical tasks	1.00	39.00	4.46	0.98
14. In this course you have to continually think about the material you are being taught	1.00	29.00	4.20	1.03

Table2 shows that among the comprising factors of Understanding (U), the sixth question ($M=4.68$, $SD=0.78$) received the highest mean followed by the tenth ($M=4.46$, $SD=0.98$), the second ($M=4.41$, $SD=0.90$). While, the fourteenth ($M=4.20$, $SD=1.03$) receives the lowest mean score.

In line with the mean of understanding aspects, the minimal score of the sixth, tenth, and fourteenth questions (7.00) is the highest, followed by the second (0.00). The maximal score of the sixth question is (39.00) the highest, followed by the tenth (39.00), the second (33.00) and the fourteenth (29.00).

The findings obtained in Reflection (R) are presented in Table 3 below:

Table 3. Descriptive Statistic of Reflection (R) of Reflective Thinking

Scale	Min	Max	Mean	SD
3. I sometimes question the way others do something and try to think of a better way	1.00	30.00	4.34	0.89
7. I like to think over what I have been doing and consider alternative ways of doing it	1.00	32.00	4.38	0.90
11. I often reflect on my actions to see whether I could have improved on what I did	2.00	33.00	4.36	0.99
15. I often re-appraise my experience so I can learn from it and improve for my next performance	1.00	38.00	2.57	0.78

Table3 shows that among the comprising factors of Reflection (R), the seventh question ($M=4.38$, $SD=0.90$) received the highest mean followed by the eleventh ($M=4.36$, $SD=0.99$), the third ($M=4.34$, $SD=0.89$). While, the fifteenth ($M=2.57$, $SD=0.78$) receives the lowest mean score.

In line with the mean of reflection aspects, the minimal score of eleventh question (2.00) is the highest, followed by the third, seventh, and fifteenth (1.00). The maximal score of the fifteenth question (38.00) is the highest, followed by the eleventh (33.00), the seventh (32.00) and the third (30.00).

The findings obtained in Critical Reflection (CR) are presented in Table 4 below:

Table 4. Descriptive Statistic of Critical Reflection (CR) of Reflective Thinking

Scale	Min	Max	Mean	SD
4. As a result of this course I have changed the way I look at myself	2.00	30.00	4.29	0.99
8. This course has challenged some of my firmly held ideas	1.00	28.00	4.07	0.92
12. As a result of this course I have changed my normal way of doing things	2.00	25.00	4.11	1.08
16. During this course I discovered faults in what I had previously believed to be right	1.00	35.00	4.45	0.88

Table 4 shows that among the comprising factors of critical reflection (CR), the sixteenth question ($M=4.45$, $SD=0.88$) received the highest mean followed by the fourth ($M=4.29$, $SD=0.99$), the twelfth ($M=4.11$, $SD=1.08$). While, the eighth ($M=4.07$, $SD=0.92$) receives the lowest mean score.

In line with the mean of critical reflection aspects, the minimal score of the fourth and twelfth questions (2.00) is the highest, followed by the eighth and sixteenth (1.00). The maximal score of the sixteenth question is (35.00) the highest, followed by the fourth (30.00), the eighth (28.00), and the twelfth (25.00).

To sum up, the average mean of each of the four components was 3.81 for habitual action, 4.44 for understanding, 3.91 for reflection, and 4.23 for critical reflection.

Conclusion

This study aimed to investigate the four components of reflective thinking: understanding, reflection, critical reflection, and habitual action of preservice mathematics and science teachers who completed their teaching practice practicums and action research.

The results of the study show that understanding received the highest mean followed by critical reflection and reflection. On the other hand, habitual actions had the lowest average score. These results indicate that preservice teachers exhibited skills related to high-order thinking abilities like understanding, reflection, and critical reflection more than lower-order thinking abilities related to memorization and rote learning, i.e., habitual action. As expected after completing courses and practicums in which reflection is a main objective, preservice teachers showed mastery over two components, reflection and critical reflection, that ensure their deep learning approaches and the acquirement of the necessary skills to become qualified teachers who are responsible of their own progress and who reflect on their own accomplishments in the future.

These findings are compatible with Ghanizadeh and Jahedizadeh (2017) who studied undergraduate and graduate students and found out that reflection and critical reflection had higher mean scores than habitual action. These study's results are also parallel with those of Sargent's (2015) study among college students which revealed that habitual thinking had the lowest score whereas understanding score was the highest.

We consider that the results of this study highlighted the critical significance of reflective thinking skills for preservice teachers. Given that reflective thinking skills equip them with the capabilities needed to progress, teachers who engage in reflective practice are more equipped to behave critically, and become more conscious of the process of teaching (Farrell, 2014).

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