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# REFLECTIVE TEACHING AND METACOGNITION IN ROMANIAN TEACHERS' PRACTICE. A CONCEPTUAL DELIMITATION

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## Abstract

Reflective thinking and metacognition are two important concepts within the field of education. These terms have frequently been used interchangeably, although research indicates efforts to distinguish them. The literature presents various models of both metacognition in learning and reflection in learning, which develops the two concepts separately. However, there are some integrative models that aim to combine these concepts to facilitate a better correspondence of theory and practice in teaching and learning. There is little research in Romania focused on the integration of reflective thinking and metacognition and this study aims to enrich the information within this field. Considering both individual and integrative models of metacognition and reflective thinking, this study focuses on the extent to which teachers use reflective learning and metacognition skills in teaching. Participants agreed to answer to questions assessing reflective practices encompassed by the Reflective Thinking for Teachers Questionnaire (RTTQ) and also items regarding metacognition comprised in the Teacher Metacognition Inventory (TMI). Furthermore, it seems that although these variables / concepts correlate with each other, there are also differences in metacognitive skills according to the level of reflective-thinking skills used in problem-solving. The information gathered within the present survey allows us to draw valuable conclusions with concern to reflective learning and metacognition in teaching offering a new perspective on this subject.



*Keywords:* Reflective thinking skills, metacognitive skills, pre-service and in-service teachers, inquiry

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# 1. Introduction

Reflective thinking and metacognition have been core themes in education research for decades. Yet they keep raising questions and even controversies in terms of conceptual delimitation and classroom applications. Ever since Flavell's introduction of the metacognition term in 1979, these proved to be quite intricate to conceptualize. Literature focusing on reflection and metacognition has indicated the tendency of interchangeable use of these two terms (Moallem et al., 2019; Morris, 2010; Yancey, 2016). Duffy et al. (2009) state that "Given that metacognition "thinking about thinking", it is a short step in associating metacognition with "reflecting on one's thinking" (p. 242).

## 1.1. Reflective thinking

In the conceptualization of reflective thinking, researchers have highlighted the cyclicity of the process. It is the case of the theoretical models proposed by Kolb and Gibbs. For instance, the Experiential Learning Cycle developed by Kolb (1984) comprises four stages through which only an efficient learner could pass. In his vision, it is not frequent that people could arrive to gain mastery over the entire cycle (Kamis & Khan, 2019). Concrete experience is the first stage corresponding to the assigning of the task. The following stage, reflective observation, depicts the student reviewing the experience so far. The third stage refers to abstract conceptualisation, the student trying to understand the experience. The last stage is the active experimentation in which the student practices what it was learnt.

The other approach that reveals the cyclicity of the process is Gibbs' model of reflection (1988) illustrates a behavioural pattern that may be summarized as a previous reflection-based action. Gibbs' reflective cycle encompasses six components: description- the students retrace the details of the situation; feelings- the student determines the emotions and thoughts related to the events; evaluation- the students give positive or negative attributes to the experience; analysis- the student assesses the sense of the situation; conclusion: the student reviews other solutions for the event; the action- envisioning the plan for a future similar situation.

A different approach comes from Schön (1983), who delimitates between two types of reflection, namely reflection-in-action and reflection-on-action. Schön (1991) also states that experimentation, reflection and action are cyclic. However, in his view reflection does not occur only post-event. The reflection-in-action component stresses the continuity of the process, the previous events gathered knowledge animating and leading the path to new actions. The second level of the process, reflection-on-action, addresses the post-experience reasoning about the acquired knowledge and how it could be used in a future learning experience (Sellars, 2017).

## 1.2. Metacognition

Metacognition has been defined as cognition about one's own cognition (Flavell, 1979) or the ability to actively control a variety of cognitive processes (Pintrich, 2000; Tobias & Everson, 2009; Moss, 2007). Flavell, one of the first researchers who focused on metacognition, argues that the ability to control the cognitive processes involved in learning is related to the metacognitive knowledge, experiences and skills that students possess. These three dimensions are essential to manage different cognitive processes.

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Metacognitive knowledge can be defined as beliefs about tasks, strategies and goals, metacognitive experiences comprise affective experiences related to cognitive processes and, lastly, metacognitive skills are the strategies used for controlling cognitive processes (Flavell, 1979; Desoete & Ozsoy, 2009).

In addition to the perspective developed by Flavell (1979), another perspective of metacognition is the one developed by Brown (1987). According to Brown's perspective, metacognition consists of two dimensions: knowledge of cognition and regulation of cognition. Knowledge of cognition is defined as how students understand their declarative, procedural and conditional knowledge, while regulation of cognition involves strategies such as planning, evaluating and monitoring (Brown, 1987; Jacobs & Paris, 1987; Schraw & Moshman, 1995; Lee, Teo & Bergin, 2009; Spada, Georgiou & Wells, 2010). A student who knows that learning is easier when there is interest for the subject being studied, who becomes aware when he/she understands something and who uses different learning strategies according to the situation, might be described as a student who possesses knowledge about his/her declarative, procedural and conditional knowledge. Further, a student who thinks of several ways to solve a problem and who checks his/her work can be described as a student who regulates his/her cognition.

The first dimension of the model developed by Brown (1987) emphasizes the important role of declarative, procedural and conditional metacognitive knowledge. Researchers (Schraw, 1998; Schmitt, 2005; Harris et al., 2009) define declarative knowledge as the knowledge that a student holds about himself/herself as a learner (e.g. strengths, weakness, interests), about tasks and task-relevant strategies and about the factors that influence his/her performance. Procedural knowledge has been defined as knowledge about one's cognitive processes, unlike declarative knowledge which emphasizes knowledge about one's cognition (Misailidi, 2010). Procedural knowledge involves knowledge about how to apply different strategies to control the cognitive processes involved in learning. Declarative metacognitive knowledge can be described as the "knowing that", while procedural metacognitive knowledge might be described as the "knowing how". In addition to these two dimensions of metacognitive knowledge, Brown (1987) included a third dimension that deals with "knowing why and when" knowledge. The third dimension, conditional metacognitive knowledge, refers to students' ability to explain their decisions concerning their memory actions (Schneider & Lockl, 2004). More specifically, conditional knowledge involves information about why and when to use declarative and procedural knowledge, helping students to efficiently allocate their resources according to specific tasks (Schraw, 1998).

The second dimension of Brown's model, the regulation of cognition, has been subdivided into two components. The first component is the monitoring of cognitive processes and involves knowledge about the effectiveness of strategies ("is this strategy efficient?"). The second component, the ability to regulate cognition to improve effectiveness refers to the strategies employed for enhancing the efficacy of the learning strategies (Williams & Atkins, 2009). These two functions of metacognition - monitoring and control - are also found in Flavell's model. The three dimensions of metacognition considered essential in monitoring different cognitive processes (metacognitive knowledge, experiences and skills) are believed to influence the student's learning through two functions: monitoring and control. The monitoring function expresses itself through metacognitive knowledge and metacognitive experiences. In contrast with the monitoring function, the control one is represented by metacognitive skills (Efklides, 2006).

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An integrative approach is proposed by Zimmerman (2000) through his Process-Oriented Model of Self-regulated Learning. The three phases of this socio-cognitive cyclic model comprise: 1) forethought, referring to the goals, planning of the task and self-motivation beliefs; 2) performance, focusing on self-control and self-monitoring; 3) self-reflection involves a criteria-based evaluation of the inquiry task in the search for developing methods of obtaining better outcomes.

## 2. Problem Statement

The use of metacognition in teaching offers an added value to the strategies that enable students not only to solve problems but also to reflect on how and why they have to learn a certain content (Ellis et al., 2014), explaining them the learning goals. The "how" refers to the teachers' role of modelling the strategies of the thinking process and scaffolding, while the "why" refers to the creation of opportunities to practice skills. Knowing the reflective and metacognitive behaviors of teachers and their frequency of application in the classroom are topics of interest in education.

## 3. Research Questions

This research aimed to answer the following three research questions: (1) How often do student teachers use their reflective thinking skills in problem-solving? (2) What metacognitive skills do pre-service and in-service teachers use in teaching? and (3) What is the relationship between metacognitive and reflective thinking skills?

## 4. Purpose of the Study

The purpose of this study was to identify what are the metacognitive and reflective skills that pre-service and in-service teachers use in teaching. The first objective of the study was to identify the frequency with which pre-service and in-service teachers use reflective thinking skills in teaching. The second objective was to establish what metacognitive skills do teachers use in teaching while the third one aimed to analyse the relationship between these two concepts.

## 5. Research Methods

### 5.1. Participants and sampling method

The sample of the study has 258 pre-service and in-service teachers who attended university classes at Babes-Bolyai University in Cluj, during the 2nd semester. Participants were chosen from the training course in which they were enrolled, referred to earlier on, and were asked to answer to a questionnaire. Considering that courses at the university level were held online during the 2nd semester of the year 2019-2020, teachers were asked to fill in the questionnaire during an online evaluation.

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### 5.2. Instruments

The instruments used to gather the information were two scales that have already been used in the literature and found to be effective in assessing both metacognitive skills and self-reflection skills in teachers. The first one, the Reflective Thinking for Problem Solving Scale was developed by Kizilkaya and Askar in 2009 and has 14 items grouped in three sub-scales: questioning (5 items), reasoning (4 items) and evaluating (5 items). The items are measured on a 5-point Likert scale: 1=Never, 2=Rarely, 3=Sometimes, 4=Usually and 5=Always and has an internal consistency of 0.84. Considering validity, Kizilkaya and Askar have run a confirmatory factor analysis and got the following results: CFI= 0.95, RMSR= 0.08, RMSEA= 0.071. It seems that the Reflective Thinking for Problem Solving Scale is an adequate instrument through which we can measure the reflective thinking skills of pre-service and in-service teachers. About the second scale applied in this research, we considered that the Teacher Metacognition Inventory would be appropriate to assess the metacognitive skills of teachers. The Teacher Metacognition Inventory was developed by Jiang, Ma and Gao in 2016 and the final version have 28 items measured on a 5-point Likert scale (1-Strongly disagree, 5-Strongly agree). The inventory has six sub-scales grouped into (1) Teacher metacognitive experience, (2) Metacognitive knowledge about pedagogy, (3) Teacher metacognitive reflection, (4) Metacognitive knowledge about self, (5) Teacher metacognitive planning and (6) Teacher metacognitive monitoring. For the present study, we have used items of the following subscales: teacher metacognitive experience, metacognitive knowledge about the self, teacher metacognitive planning, and teacher metacognitive monitoring. To check for the validity and reliability of the scale, Jiang, Ma and Gao run a series of analysis (item discrimination index, exploratory factor analysis, convergent validity analysis, parallel analysis, and reliability analysis) which shows that the Teacher Metacognition Inventory is well suited to be used in our research. Demographic information was gathered through the demographic form which has a series of questions developed by researchers and comprises gender, teaching degree, teaching experience, and the level of teaching.

## 6. Findings

Results indicated high-reliability indicators of the scales used in the study. Accordingly, the Reflective Thinking for Problem Solving Scale has a Cronbach's Alpha of 0.90 and The Teacher Metacognition Inventory one of 0.76. Following Can (2015), Sivaci (2017) and Demirel et al. (2015) we have distributed the responses of the Reflective Thinking for Problem Solving Scale in three levels: low, medium, and high. The low level comprises the scores between 14 and 32, the medium level the scores between 33 and 51 and the high level the range of scores between 52-70.

To answer the research questions proposed in the present study and to analyze the data we have used the SPSS software.

### 6.1. Demographic characteristics of teachers

First, we have run the descriptive statistics analysis to examine the demographic background of our participants. Nearly all of our participants are female teachers (97%), with no didactic degree (73%)

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and with less than 1 year of experience. The demographic characteristics of the participants are illustrated in Table 01.

**Table 1.** Demographic characteristic of teachers

| Gender | Teaching degree | Level of teaching | Teaching experience |
|---|---|---|---|
| 97% Females<br>3% Males | 73% No teaching degree<br>13% Definitive teaching degree<br>10% The 1st teaching degree<br>4% The second teaching degree | 43% Teaching practice<br>24% Kindergarten<br>15% Primary school<br>8% Secondary school | 45% Under 1 year of experience<br>34% Between 1-4 years<br>7% Between 5-10 years<br>6% Between 11-12 years<br>8% Over 13 years |

### 6.2. Teacher's responses to the frequency of using reflective thinking skills

The first question of the research aimed to identify to what extent teachers use reflective thinking skills in their practice. The descriptive statistics presented in Table 2 show how frequent teachers use reflective thinking skills in problem-solving. Responses have been grouped in 3 categories: rarely / never, sometimes, and always / most of the time. It seems that participants use quite frequently reflective thinking skills in problem-solving. Most of the participants take into consideration the methods they use when solving a problem (94.20%) and focus on the needed information to solve a problem (95.3%). When failing to solve a problem, 88% of teachers ask themselves questions to understand why they were not able to solve it. Furthermore, questions are also addressed to better understand the information given in the text of a problem (87.2%). The lowest percentages were for the items of the evaluation sub-dimension of the scale: "I question the solutions of my colleagues, and try to find better ones" (55.8%) and "After completing a problem, I make comparisons between the solutions of my colleagues, and assess my own solution accordingly" (47.2%).

**Table 2.** Teacher's responses to the frequency of using reflective thinking skills (in percentages)

| Items (Reflection) | Rarely / Never | Sometimes | Always / Most of the time |
|---|---|---|---|
| When I fail to solve a problem, I ask myself questions to understand why I was not able to solve it. | 3.5 | 8.5 | 88 |
| After I solve a problem, I ask myself whether I can find even better ways of solving it. | 5.5 | 19.8 | 74.80 |
| I question the solutions of my colleagues, and try to find better ones. | 13.10 | 31.0 | 55.80 |
| I reassess possible solutions again and again, so that I may be better able to solve the next problem. | 5.5 | 23.6 | 71 |
| When solving a problem, I act by carefully considering the methods I use. | 2.4 | 3.5 | 94.2 |
| After I solve a problem, I examine and reevaluate the methods I have used. | 7.8 | 14.3 | 77.90 |
| When solving a problem, I ask myself questions to come up with different solutions. | 4.7 | 14 | 81.4 |
| When solving a problem, I think of the reason why I have used a particular method, and try to determine its relationship with the outcome of the solution. | 7.7 | 20.2 | 72.1 |
| When I read a problem, I consider the information that I need for solving. | 3.1 | 1.6 | 95.3 |

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| | | | |
|---|---|---|---|
| After I solve a problem and find a solution, I check the methods I have used. | 7 | 14.7 | 78.3 |
| When I read a new problem, I think of the problems I have solved before, and establish a relationship between these two based on their similarities and differences. | 8.1 | 17.1 | 74.8 |
| When solving a problem, I always think about the previous and ensuing steps of the method being used. | 5.1 | 14.7 | 80.3 |
| When I read a problem, I ask myself questions to better understand the information being provided, and the solution that is requested. | 3.9 | 8.9 | 87.2 |
| After completing a problem, I make comparisons between the solutions of my colleagues and assess my solution accordingly. | 22.5 | 30.2 | 47.2 |

Table 02 clearly illustrates the high percentages of teachers who employ self-reflective thinking skills in problem-solving. Besides the percentages presented in Table 02, we continued with the analysis and determine the means, standard deviations, and the minimum and maximum scores for each of the three subscales of the Reflective Thinking for Problem Solving Scale. These are illustrated in Table 03 presented below.

**Table 3.** Means for the three subscales of The Reflective Thinking for Problem Solving Scale

| | **Statistics** | | |
|---|---|---|---|
| | **Questioning** | **Evaluation** | **Causation** |
| **N Valid** | 258 | 258 | 258 |
| **N Missing** | 0 | 0 | 0 |
| **Mean** | 21,21 | 19,31 | 16,60 |
| **Std. Deviation** | 3,15 | 3,46 | 2,77 |
| **Minimum** | 6,00 | 5,00 | 4,00 |
| **Maximum** | 25,00 | 25,00 | 20,00 |

The minimum scores of Questioning, Evaluation and Causation range between 4-6 points and the maximum between 20-25. The Questioning sub-scale has a mean of $\bar{X}$ =21,21 (SD=3.15) while evaluation has one of $\bar{X}$ =19.31 (SD=3.46) and Causation one of $\bar{X}$ =16.60 (SD=2.77). Considering that the maximum score is 25, we can see that the mean of the Questioning sub-scale is the closest to the maximum score. This means that pre-service and in-service teachers use their questioning in problem-solving. The lowest mean is the one for the Causation dimension but it is still a high one considering that the minimum score for this dimension is 4. Concerning the means presented above we can conclude that student teachers use their reflective thinking skills in problem-solving quite frequently.

### 6.3. Participants'responses to the items measuring metacognition

Besides reflective thinking skills in problem-solving, metacognitive skills are also used to a high degree by teachers who participated in the study. Participant's responses for this variable are illustrated in Table 04.

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**Table 4.** Teachers' responses to the items measuring metacognition (in percentages)

| Items (Metacognition) | Totally disagree / Disagree | Neither agree nor disagree | Agree / Totally agree |
|---|---|---|---|
| When my classroom teaching fails, I always feel anxious. | 6.6 | 14.3 | 79.1 |
| When I successfully complete the classroom teaching task, I feel very relaxing | 0,8 | 1.2 | 98.1 |
| I am well aware of my weaknesses in teaching. | 3.9 | 13.6 | 82.5 |
| I prepare for the unexpected situations that may arise in the classroom | 6.2 | 24.4 | 70.1 |
| I design the specific teaching program in advance for each lesson. | 5.8 | 20.9 | 73.2 |
| I always set a specific teaching goal for each lesson | 2.7 | 10.9 | 86.4 |
| I ask myself periodically if my teaching method is applicable while I am teaching. | 6.2 | 22.9 | 70.9 |
| I check teaching progress periodically to figure out whether it meets my expectation. | 5.5 | 17.1 | 77.5 |
| I ask myself about how well I am doing while I am teaching. | 6.2 | 18.2 | 75.5 |

As can be easily observed, high percentages of participants seem to feel relaxed when successfully completed a classroom teaching task (98.10%), set specific teaching goals for lessons (86.4%), are well aware of their weaknesses in teaching (82.5%) and check their teaching progress periodically to figure out whether it meets their expectations (77.5%). The means of the four dimensions of The Teacher Metacognition Inventory are represented in Table 05. All the means of the subscales are very high, being close to the maximum score of 5. The mean of the metacognitive experience dimension is $\bar{X}$ =4.53 (SD=0.61), of the knowledge about self is $\bar{X}$ =4.20 (SD=0.85). For the metacognitive planning sub-scale the mean is $\bar{X}$ =4.07 (SD=0.68) and for metacognitive monitoring is $\bar{X}$ =4.03 (SD=0.74). These results show that students teachers who participated in our study use metacognitive skills in teaching.

**Table 5.** Means for the four subscales of the Teacher Metacognition Inventory

| | Statistics | | | |
|---|---|---|---|---|
| | **Metacognitive experience** | **Knowledge Self** | **Metacognitive planning** | **Metacognitive monitoring** |
| **N Valid** | 258 | 258 | 258 | 258 |
| **N Missing** | 0 | 0 | 0 | 0 |
| **Mean** | 4,53 | 4,20 | 4,07 | 4,03 |
| **Std. Deviation** | ,61 | ,85 | ,69 | ,74 |
| **Minimum** | 1,00 | 1,00 | 1,67 | 1,67 |
| **Maximum** | 5,00 | 5,00 | 5,00 | 5,00 |

### 6.4. Relationships between thinking skills and metacognitive skills

To examine the relationships between the two variables introduced in the study we have run a correlation analysis and presented the results in Table 06. The Pearson correlation coefficient indicates a positive and moderate correlation between reflective thinking skills and metacognitive skills:

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r(258)=0.446 p<0.01. This means that as metacognitive thinking skills increase so do the reflective thinking skills.

**Table 6.** Correlations between the two variables included in the study

| Correlations reflected thinking skills and metacognitive skills | | |
|---|---|---|
| | **Reflective thinking skills** | **Metacognitive skills** |
| **Reflective thinking skills** | 1 | ,446** |
| **Metacognitive skills** | ,446** | 1 |

**. Correlation is significant at the 0.01 level (2-tailed).

Since the correlation between reflective thinking skills and metacognitive skills has a moderate intensity, we tested to see if there are differences in metacognitive skills in students with low, medium, and high levels of reflective thinking skills. We assumed that there are significant differences between these two variables and run an ANOVA analysis. Results are presented in Table 7 and indicate the existence of significant differences between our groups of interest, with F value of F(2, 258)=31.675 (p<0.001). To identify which groups are different (low, moderate and high levels of reflective thinking skills) we have used the Tukey post-hoc test (Table 08). Tukey's test indicates that student teachers with medium reflective thinking skill differ from both those with lower (p=0.17) and higher levels (p=0.000). Interesting, the differences between those with low and those with high levels of reflective thinking skills are not significant (p=1.0).

**Table 7.** Differences between metacognitive skills and reflective thinking skills

| | **ANOVA** | | | | |
|---|---|---|---|---|---|
| | **Sum of Squares** | **df** | **Mean Square** | **F** | **Sig.** |
| **Between Groups** | 13,811 | 2 | 6,906 | 31,675 | ,000 |
| **Within Groups** | 55,594 | 255 | ,218 | | |
| **Total** | 69,406 | 257 | | | |

**Table 8.** Tuckey post-hoc analysis with Metacognition as a dependent variable

| Multiple Comparisons | | | | | | |
|---|---|---|---|---|---|---|
| **(I) Refl Niv** | **(J) Refl Niv** | **Mean Difference (I-J)** | **Std. Error** | **Sig.** | **95% Confidence Interval** | |
| | | | | | **Lower Bound** | **Upper Bound** |
| **Low level** | **Medium level** | 1,16944173* | ,42309233 | ,017 | ,1720092 | 2,1668742 |
| | **High level** | ,00640394 | ,40664153 | 1,000 | -,9522461 | ,9650540 |
| **Medium level** | **Low level** | -1,16944173* | ,42309233 | ,017 | -2,1668742 | -,1720092 |
| | **High level** | -1,16303779* | ,14645701 | ,000 | -1,5083075 | -,8177681 |
| **High level** | **Low level** | -,00640394 | ,40664153 | 1,000 | -,9650540 | ,9522461 |
| | **Medium level** | 1,16303779* | ,14645701 | ,000 | ,8177681 | 1,5083075 |

*. The mean difference is significant at the 0.05 level.

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## 7. Conclusion

Reflective thinking and metacognitive skills are essential for an active, independent, and deep learning and teaching processes. Moreover, it seems to have a major role in lifelong learning and in adaptation to professional life. Considering the benefits of reflective thinking and metacognitive skills referred to earlier on, we have conducted research focused on these concepts. We took into consideration the role of reflective thinking skills in problem-solving, that of the metacognitive skills in teachers' practices, and the relationship between these two variables. It is encouraging to find out that pre-service and in-service teachers use to a high extent both reflective-thinking skills in problem solving and metacognitive skills in teaching. Both the percentages and means of these two variables were very close to the upper limit of the range of answers.

It seems that the relationship of the reflective-thinking skills with metacognitive skills are moderate to weak if we analyze the results of the correlational tests. We have moved forward to analyze the relationships of these two variables and run an ANOVA test to see if there are differences in metacognition according to the level of reflective-thinking skills. The results of this analysis show that there are differences in metacognition only between two groups, namely between those with moderate and low level of reflective thinking skills and those with moderate and high reflective thinking skills. Surprisingly, it seems that there are no differences in metacognitive skills for those teachers who have low and high levels of reflective thinking skills. This can be explained through the small group of teachers with low levels of reflective thinking skills included in the study or through the fact that those with high levels of reflective and metacognitive skills use these skills under certain conditions (e.g., complex tasks, important learning tasks).

There are several limits to consider when analyzing the results of this study. First, we have to be aware that the sampling method employed was a convenient one and thus, non-probabilistic. Nevertheless, we believe that the sample was high enough to overcome the shortcomings due to the sampling error. Second, we find it quite interesting that the means for both scales were very high. On one hand, it is possible that teachers do use their reflective and metacognitive skills in their practice, on the other hand, the scales we have applied might be culture-sensitive and thus ineffective for the Romanian population.

Nevertheless, reflective thinking and metacognition continue to be major themes in educational research despite the timeframe that has passed since their first conceptualization. The interest in these two concepts lies in the benefits brought by their implementation in classroom practice. Moreover, considering teachers' role in modelling the learning process a future research direction would be identifying the reflective and metacognitive skills in students to see if the transfer from teachers to students occurs. Consequently, this assessment could trigger the development of a new model in order to prompt changes in the understanding of reflective thinking and metacognition in teaching and learning practices enhancing the creation of an evidence-based reflective thinking and metacognition teaching program to improve students learning skills.

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