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# Linking Achievement Goal Orientation to Socio-Cognitive Conflict Regulation in Higher Education

**Dorit Alt[1] and Yoav Kapshuk[2]**

1 Tel Hai College, upper Galilee, Israel
2 Kinneret College on the Sea of Galilee, Israel

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**Correspondence**
Dorit Alt. Tel Hai College, Kiryat Shmona, upper Galilee, 12210, Israel
altdor@m.telhai.ac.il

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## Abstract

Conflict regulation is deemed a highly important lifelong learning skill with which individuals should be equipped. This study sought to measure the effect of achievement goal orientations on socio-cognitive conflict regulation strategies and to assess the impact of designated learning activity with collaborative digital concept mapping on these strategies. Data were gathered from 66 second-year Social Sciences undergraduate students on the completion of the learning activity. Results mainly showed that the learning activity with digital concept mapping positively contributed to students' collaborative and critical socio-cognitive conflict regulation strategies rather than competitive strategies. Performance goal orientation increased less competitive collaborative socio-cognitive conflict regulation strategies. These findings underscore the importance of equipping individuals with a set of skills that enables them to effectively regulate conflicts by engaging them in socio-cognitive argumentation activities during their educational attainment. Such activities may raise their awareness of more collaborative strategies of regulation when faced with different types of conflict situations.

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Conflict is a social phenomenon, inseparable from human and social life, which occurs between or among individuals, groups, organizations, and nations (Adeney, 2016; Wallensteen, 2019). Conflict is experienced as a consequence of disagreements and inconsistencies in the course of interpersonal interactions (Wehr, 2019). In de Wit et al.'s (2012) meta-analysis of 116 empirical studies of intragroup conflict, the researchers distinguished three forms of intragroup conflict: relationship conflict – involving disagreements among group members about interpersonal issues (such as norms and values); task conflict – pertaining to disagreements among group members about the content and outcomes of the task at hand; and process conflict – referring to disagreements among group members about the logistics of task accomplishment, such as responsibilities.

Although traditionally viewed as destructive phenomena to be avoided, conflicts are currently perceived as positive forces necessary for contemporary organizations, groups, and individuals to thrive (Butera et al., 2019). For example, task-related conflicts may enable innovativeness and effective group decision-making because "they prevent premature consensus and stimulate more critical thinking" (de Wit et al., 2012, p. 306).

To manage conflicts, however, individuals should be equipped with a set of skills that enables them to effectively regulate conflicts and to understand the decision-making mechanisms applied to selecting a solution out of several options (Göksoy & Argon, 2016; Wehr, 2019). Hence, this study's main question was in what way(s) critical and collaborative socio-cognitive conflict regulation strategies can be induced by a designated learning activity. To this end, several researchers (Asterhan & Schwarz, 2016; Asterhan et al., 2009; Cheng, 2014) underscored the importance of engaging learners in socio-cognitive argumentation activities, accompanied by digital tools that have been designed and developed to facilitate argumentation processes. These processes may lead learners to share different points of view while exploring a problem from different perspectives (Avry et al., 2020), and thus raise their awareness of more collaborative and critical strategies of conflict regulation (Asterhan et al., 2009).

Moreover, because socio-cognitive conflict regulation is a process focused on demonstrating competence, the role of one's achievement goals of action in competence-relevant situations was also evaluated in this study (Elliot & McGregor, 2001). Whereas in most studies carried out on this topic the effects of achievement goals were studied in the context of the individual, the current study suggests that achievement goals should be conceptualized within social contexts and evaluates their potential effect on how students attempt to resolve conflicts (Butera et al., 2019).

Hinged upon these two main assumptions concerning motivational and pedagogical precursors of socio-cognitive conflict regulation, an argumentation-based learning activity with digital concept mapping (Lin et al., 2016) for higher education students was specially designed in the present study. Its effect on socio-cognitive conflict regulation strategies was evaluated while considering the possible impact of achievement-goal orientations on these strategies. The main contribution of this work is the proposed activity for higher-education students and its implementation, with the aim of evaluating whether this activity is efficient in developing students' critical and collaborative socio-cognitive conflict regulation strategies. The novelty of this work lies in using a technology-enabled argumentation-based learning activity in higher education and measuring specific aspects of this activity to assess conflict regulation strategies while controlling for students' individual differences.

## Socio-Cognitive Conflict Regulation

Mugny and Doise (1978) introduced the concept of socio-cognitive conflict to account for their finding that children interacting with others are more likely to progress in a task than children working alone (Butera

et al., 2019). This work was based on the Piagetian equilibration model of socio-cognitive conflict (Piaget, 1975/1985), which arises when a child's cognitive structures are disrupted by new and inconsistent information. This conflict requires some adjustment and may therefore result in more elaborate knowledge. This model is thought to be the mechanism that drives cognitive development and learning by providing learners with an opportunity to reexamine their ideas/beliefs, which, in turn, motivates them to reconcile the cognitive conflict by explaining their views to their group members (Cheng, 2014). In a socio-cognitive conflict, the individual realizes that there is a discrepancy between his or her existing knowledge and the point of view of another. This may raise doubts about the validity of one's point of view.

Conflict regulation is "the meaning that people attribute to conflict when facing another person's idea that contradicts their own" (Butera et al., 2019, p. 146). Regulatory strategies can be directed toward compliance - adopting the other's point of view. Another strategy was termed 'quick consensus-seeking / building', in which one may settle for quick consensus within the group, rather than take a critical stance toward group members' contributions (e.g., trying to avoid confrontations, deferring to the other person's views; Asterhan & Schwarz, 2016). By using this strategy, the individual accepts the contributions of others not because s/he is convinced, but rather to be able to continue the discourse. Hence, this regulatory strategy may not indicate an actual change of perspective but is, instead, a coordinating discourse move. This strategy may be detrimental to individual knowledge acquisition when learners disregard other forms of consensus building in favor of quick consensus-building (Weinberger & Fischer, 2006). Two additional strategies were suggested by Asterhan et al. (2009), *private deliberation* - whereby the individual re-examines his/her ideas independently and re-thinks his/her solution independently before taking the next step; and *co-constructive, critical peer argumentation* – whereby one attempts to understand one's partner, to collaboratively examine each idea critically with his/her partner and come up, together, with the best solution.

The question of how socio-cognitive conflict regulation can be induced was discussed in numerous studies (Asterhan & Schwarz, 2016; Asterhan et al., 2009; Cheng, 2014). Based on the social-constructivist approach to learning, these researchers suggested engaging learners in dialectical argumentation, a type of socio-cognitive conflict paradigm, where argumentation activities may be encouraged. Toulmin (2003) defined argumentation as a process that produces theories or assertions and provides support and justification by way of evidence. The construction of a single argument, based on Toulmin's model of arguments, includes six components: claim, grounds, warrant, qualifier, rebuttal, and backing. Claims are statements that put forward the position learners take. Grounds are proofs, warrants are logical connections between the grounds and claims that indicate how a claim is supported by the grounds. Qualifiers are statements that limit the validity of a claim to specific circumstances. 'Rebuttal' addresses potential objections or alternative viewpoints. One may want to refute an objection to his/her claim to substantiate the argument. 'Backing' provides additional support for the warrant (Weinberger & Fischer, 2006). Tsovaltzi et al. (2017) posited that the deliberate practice of elaborating on learning material by constructing formally and semantically sound arguments can aid deep learning, induce increased self-reflection and conflict awareness, and help in attitude co-construction.

Nonetheless, there are indications that even adult learners rarely construct warranted and qualified claims on their own (Weinberger & Fischer, 2006). To scaffold the process, online environments were found to support the sharing, constructing, and representing of arguments in multiple formats for what has been termed Argumentation-Based Computer-Supported Collaborative Learning (ABCSCL, Valero-Haro et al., 2019). In online environments where argumentation can be visualized, learners have more time to formulate their arguments, which may facilitate argumentative knowledge construction.

## Online Learning with Concept Mapping

### Online Tools for Conflict Regulation

The benefit of online argumentation tools for conflict regulation was shown for example in Tsovaltzi et al.'s (2017) study, in which group awareness tools were used in social networking platforms to increase awareness of attitude conflicts and argumentation scripts as cognitive guidance to help university students resolve the conflict productively. These researchers assessed the effects of argumentation on attitude change relative to peer interactions by measuring the number of interactions, information flow control, influence distribution, and attitude similarity. Group awareness tools and argumentation scripts, alike, influenced group processes, but argumentation scripts showed an even more substantial influence. They concluded that in social networking platforms, group awareness tools can foster socio-cognitive conflict and prompt more individuals to actively engage in meaningful dialogue surrounding conflicts. Social networking sites define a rich context of socio-cognitive interactions in which a conflict can arise.

Asterhan and Schwarz (2016) listed a number of software tools that have been designed and developed to facilitate argumentation processes in real-time, for example, computerized collaboration scripts, visual representations of argumentation structures, predefined sentence openers and dialogue moving classifiers, and automated group arrangements to create maximal diversity of ideas. Yet, although their review showed the effectiveness of technology design in supporting students' online argumentation, the authors pointed to several lacunae; mainly that the research has focused on the effects of software design on online argumentation without empirically considering its effects on individual domain-specific learning gains or on the social, transactive aspects of argumentative dialogue.

### Online Concept Mapping to Facilitate Argumentation Processes and Collaboration

To circumvent this problem, in the current study a technology-enabled concept mapping method was used for the first time to facilitate argumentation processes. A concept map is a visual representation of knowledge (Novak & Gowin, 1984). The process enables one to organize and structure information and the relationships between them within a particular domain. This may be done in a wholly graphical manner (i.e., using images, photos, colors, etc.) to highlight differing concepts and their linkages, or by identifying key concepts by names or titles and enclosing them in visual boxes (Jennings, 2012). Concept maps may aid the instructor in assessing what students understand and how they relate the material to the overall course goals. These maps are easily taught and can be incorporated in introductory units, midterm reviews, and assessments, peer assessments, self-assessments, or end-of-course reviews and assessments (Machado & Carvalho, 2020).

In contrast to lecture-based teaching methods, concept mapping is a student-centered method that has been demonstrated repeatedly to have a positive impact on the quality of student learning. It does so by improving students' thinking and decision-making skills, abstract reasoning, critical thinking skills, meaningful learning levels, and creativity in comparison to the more passive lecturing method (Chan, 2017). Concept maps provide a way to address 21$^{st}$-century skills identified as critical thinking and problem-solving (e.g., Partnership for 21$^{st}$ Century Skills, 2014). Students learn how to frame, analyze, and synthesize information to solve problems and answer questions. Although concept mapping can be easily utilized for co-constructed arguments, literature in the area of argumentation design through concept mapping remains sparse.

Drawing on social constructivism, increasing research has been devoted to investigating the effectiveness of collaborative concept mapping (Lin et al., 2016). Using collaborative concept mapping,

students co-construct their common knowledge by negotiating and developing the relationships they write on their maps. Koc (2012) reported that sharing maps with other students fosters an understanding of different perspectives of the content as learners can negotiate on shared meanings with the assistance of others. According to his findings, students enjoyed sharing concept maps with their peers in small groups and perceived collaborative maps as more effective than individual ones. Similarly, other researchers showed how the construction of online conceptual maps, which included online group brainstorming and discussions, helped students understand content-related processes (Gerber-Hornink & Costa, 2021); increased student engagement in all types of tested engagements, namely behavioral, emotional, and cognitive (Fatawi et al., 2020); enabled the integration of the content and a comparison of collaborative discussions (Sher et al., 2020); allowed students to use propositions from other students to enhance their concept maps (Canas et al., 2001); established a supportive problem-based learning environment (Stoyanova & Kommers, 2002); and fostered international collaboration (Aarons et al., 2019).

## Achievement Goals and Conflict Regulation

Because socio-cognitive conflict regulation is a process focused on demonstrating competence, the assessment of the predictive role of one's achievement goals of action in competence-relevant situations is of bearing to this study (Elliot & McGregor, 2001). Several researchers (Asterhan & Schwarz, 2016; Asterhan et al., 2009) maintained that among other learning motivation theories, the achievement goal theory (Pintrich, 2000; Urdan, & Kaplan, 2020) can explain socio-cognitive conflict regulation. A goal was defined as "a future-focused cognitive representation that guides behavior to a competence-related end state that the individual is committed to either approach or avoid" (Hulleman et al., 2010, p. 423), thus viewed as separate from the reason or reasons why the person is pursuing the aim (Elliot & Thrash, 2002). According to Elliot and Murayama (2008), achievement goals can be construed in terms of purposeful commitments that guide future behavior.

Two broad categories of achievement goals, subdivided into two secondary categories, were indicated in the literature: *Mastery-approach* (or learning/task) and *mastery avoidance goals* (reflecting the desire to avoid performing worse than one aspires to) versus *performance-approach* (or ability/ego-involvement) and *performance-avoidance goals*, which focus on not being outperformed by other people (Elliot & McGregor, 2001; Elliot et al., 2011). Mastery goals, which are centered upon knowledge acquisition and mastery of tasks, relate to the learner and the knowledge and skills to be learned. Accordingly, a student may want to succeed because s/he wants to learn and understand the material – mastery of the content - and therefore may utilize higher quality learning strategies, display high self-efficacy and task persistence, and thus be considered an intrinsically motivated learner (Pintrich, 2000; Urdan, & Kaplan, 2020). Individuals holding mastery-approach goals perceive effort as an integral part of the development process and as an essential component of success. Giel et al. (2020) argued that being mastery-approach oriented should make students want to share their information and resources, ask their group members critical questions, candidly share their own opinions, and discuss all possible perspectives of the task at hand. In contrast, students who hold performance learning goals focus on how they perform relative to each other and seek to get a good grade merely to demonstrate to others that they are better than them. This might indicate a greater academic ability but not necessarily content mastery (Maehr & Zusho, 2009). The aim of these students, who believe that competence is a fixed and innate attribute that cannot be improved, is to outperform others. Having to put in an effort is perceived by them as a lack of ability (Giel et al., 2020).

Although abundant, in most of the studies carried out on this topic, the effects of different goals were studied in the context of the individual, through a pure relationship between the individual and a task, despite the fact that achievement tasks were usually carried out in social contexts (Darnon et al., 2007). Nonetheless, several studies provided empirical support for the theoretical hypothesis that mastery-

approach goals and performance-approach goals will be differentially related to behavioral patterns in conflict regulation. For example, Asterhan et al. (2009) showed how undergraduate students' achievement goals predicted different behavioral patterns of socio-cognitive conflict regulation in learning settings. Mastery goals predicted co-constructive critical peer argumentation, whereas performance-avoidance goals predicted quick consensus-seeking. Competitive debating was predicted by performance-approach goals. Finally, mastery goals predicted private critical deliberation, which refers to the critical consideration of different perspectives in a private, non-dialogical manner. Asterhan et al. suggested considering the role of goals pursued by students when they perform an achievement task and their relationship with different types of peer dialogue when these are necessary to engage in a critical discussion on a learning topic.

Similarly, more recent studies (Asterhan & Schwarz, 2016; Butera et al., 2019; Sommet et al., 2014; Sommet et al., 2015) indicated that achievement goals affect how students attempt to resolve conflicts. Mastery goal-oriented students placed an emphasis on its epistemic dimension because they were oriented to understanding and perceiving people who disagree with them as a means of informational support. Performance goal-oriented students, on the other hand, focused on the interpersonal dimension of a disagreement, thus tended to exhibit competitive conflict regulation because they were oriented toward establishing their own superiority and perceiving people who disagree with them as opponents. Performance-avoidance goals predicted protective conflict regulation because they oriented learners toward avoiding inferiority and perceiving people who disagree with them as threats to be avoided. However, although theorists have contended that mastery goals enhance learning and that performance goals impair it, the existing literature has partially overlooked the differential effects of motivational variables on social conflict regulation.

In summary, two main points emerge from the above-surveyed studies. The first pertains to the achievement goal theory, suggesting that mastery and performance goals may lead to different conflict regulation processes and outcomes (e.g., mastery goal may enhance collaboration strategies whereas performance goal may lead to competitiveness). Second, research into conflicts (e.g., in organizations) suggested that conflicts between group members should not be perceived as a hindrance to effective group functioning (de Wit et al., 2012). Yet, to promote socio-cognitive conflict regulation strategies, students should be involved in problem-based learning activities which include brainstorming and collaborative discussions (Sher et al., 2020).

## Hypotheses and the Proposed Model

Based on the foundation of the aforementioned studies, in this study, an argumentation-based learning activity with digital concept mapping for higher education students was designed. The first aim was to measure the effect of achievement goal orientations on socio-cognitive conflict regulation strategies. The second aim was to understand how the argumentation-based learning activity with digital concept mapping may promote socio-cognitive conflict regulation strategies. Accordingly, the following hypotheses were formulated:

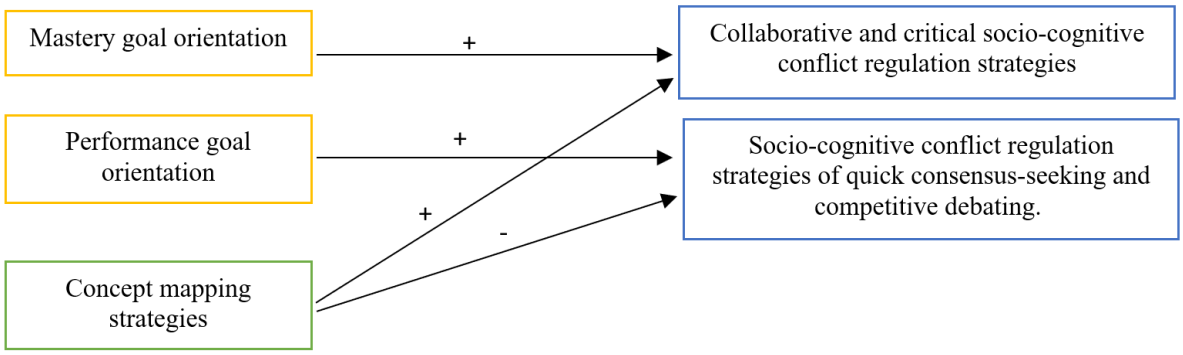
***Hypothesis 1.*** The high level of mastery goal orientation will predict more collaborative socio-cognitive conflict regulation strategies such as collaborative and critical strategies, whereas the high level of performance goal orientation will predict less collaborative socio-cognitive conflict regulation strategies such as quick consensus-seeking and competitive debating.

***Hypothesis 2.*** The preferred use of concept mapping strategies will predict higher likelihoods of using collaborative socio-cognitive conflict regulation strategies and lower likelihoods of using competitive socio-cognitive conflict regulation strategies such as quick consensus-seeking and competitive debating.

Background variables (e.g., socioeconomic status [SES], age, gender, and ethnicity) were addressed to examine and control for their potential effect on the research constructs. Figure 1 illustrates the theoretical structure of the proposed framework.

**Figure 1**

*The Conceptual Model (Model 1)*




## Method

### Participants

A compulsory 13-week course entitled 'Conflict Dynamics and Negotiations' was randomly selected for this research (out of four identical courses given during the second semester) with a total of 96 second-year Social Science undergraduate students from one major college located in the northern periphery of Israel. The students were assigned to the courses based on their available time slot. Quantitative data were gathered from those who chose to complete the questionnaires and ultimately included 66 participants.

Participation in the study was voluntary. It was made clear that the student can withdraw at any time, and no incentive or penalty was associated with the study. Prior to obtaining participants' consent, it was explained that the questionnaires were anonymous and that returning a partially completed questionnaire was acceptable, should they choose to do so. Finally, participants were assured that no identifying information would be processed. The study was preauthorized by the college's *Ethics Committee.*

Demographic data were gathered using a questionnaire aimed at ascertaining the student's ethnic group (Jewish/Arab minority), gender (male/female/other), age, and socioeconomic status (SES). The last variable was assessed by the student's father's educational attainment (FEA) and mother's educational attainment (MEA), both defined on a six-level scale: 0 = *lack of education*, 1 = *elementary school*, 2 = *high school*, 3 = *BA degree*, 4 = *MA degree*, 5 = *doctoral degree*. Student characteristics indicated that 83% of the sample were females, and the mean age was 23.58 (*SD* = 9.30). Regarding ethnicity, 89% were minority Arab students, and 11% were Jewish students. Non-significant differences were shown between the ethnic groups on the demographic variables, with the exception of *age* ($t_{[50]}$ = 2.60, $p$ < .05). The Arab group's mean age (*M* = 21.11, *SD* = 8.12) was lower than that of the Jewish group (*M* = 30.86, *SD* = 10.30).

**Argumentation-Based Learning Activity with Digital Concept Mapping Design**

The activity included three stages:

***Stage 1***

At the beginning of the semester, the students were presented with a conflict between a married couple named Dana and Rami. These names are common in both Arab and Jewish communities, hence were chosen to neutralize possible cultural bias. The students were asked to report how the conflict could be resolved, using appropriate argumentation. The students had to communicate what they thought the protagonists should do (Sheykh, & Emadian, 2019). This decision had to be taken with the students knowing very little and based simply on their common sense and knowledge (duration: 1 lesson).

***Stage 2***

The students were exposed to the course contents that included models for dealing with conflicts, such as the Thomas-Kilmann Conflict Model (Kilmann & Thomas, 1977; Shell, 2001), models for cooperation (Adam Grant's Give and Take Approach; Grant, 2013), the Difficult Conversations Approach (Stone et al., 2010), and Marshall Rosenberg's Nonviolent Communication Model (Rosenberg, 2015). The students were taught the material through lectures and by reading academic articles (duration: 5 lessons).

***Stage 3***

At this stage (duration: 7 lessons), the students received a complex task with the objective of learning how to construct an argument. They were asked to review the dilemma presented to them at the beginning of the course which dealt with a conflict between a couple. This time, however, they were asked to work in groups (students could choose their own group members, and their mode of interaction online or face to face) and to submit a paper that discussed the following:

1. Choose four models that can potentially either resolve the conflict or exacerbate it.
2. Note the names of the four models and describe them.
3. Describe how each model might resolve or deepen the conflict.
4. Base each argument on support or evidence provided by the study material or other sources such as press materials or educational videos.
5. Describe and explain at least two similarities or differences between the various models and arguments.

In addition, the students were asked to present their work using Mindomo. This digital platform allows the user to visually outline complex concepts, tasks, or ideas. It covers concept mapping, task mind mapping, and outlining functionalities and has many uses in education, business, personal development, and anywhere a clear overview of a task, idea, or plan is required. Mindomo enables real-time collaboration, has multiple layouts, and functions as a hypertext-based environment enabling the integration of a wide range of formats. A designated online lesson, accompanied by instructive materials, was delivered to the students by the educational staff, aiming at familiarizing students with the Mindomo platform. Students could also receive additional guidance in small groups, including training sessions on Mindomo.

Finally, the students were asked to relate to their personal learning process (self-assessment) by writing a reflective journal in which they were instructed to write about their self-perceived progress from the departure point of their preliminary argument progressing to a more complex one and to describe their challenges and gains in light of the learning experience. Moreover, to assess their maps, the students were provided with well-established criteria, relating to the provision of arguments and supporting

information, hierarchy, relationships among arguments / supporting information, and clarity of the map (Panadero et al., 2013).

## Measurements

### *Achievement Goal Questionnaire*

In the present study, the 12-item Achievement Goal Questionnaire-Revised (Elliot & Murayama, 2008) was utilized. Participants were asked to indicate their degree of agreement with each item on a six-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (6). Subscales and internal consistency values were: *mastery-approach*, for example, 'My aim is to completely master the material presented in this class'; *mastery-avoidance*, for instance, 'My aim is to avoid learning less than I possibly could'; *performance-approach*, for example, 'My aim is to perform well relative to other students'; and *performance-avoidance*, for example, 'My aim is to avoid doing worse than other students'.

A principal axis factoring followed by a varimax rotation was used to corroborate the stability of the scale structure (eigenvalue > 1.00; item loadings > .30). The analysis solution accounted for 59.9% and yielded only three categories: mastery goal orientation: mastery-approach, mastery-avoidance, and performance-approach. Cronbach's alpha reliability results ranged from .75 to .89.

### *Socio-Cognitive Conflict Regulation Strategies*

Peer collaboration behavior in socio-cognitive conflict (PCBSC) was used to assess socio-cognitive conflict regulation strategies**.** In this 15-item scale (Asterhan et al., 2009) students were asked to report, on a Likert scale ranging from *strongly disagree* (1) to *strongly agree* (6), to what extent each item would describe their behavior in the following scenarios (Kuhn et al., 2010): "The director asks your three-person team to develop a new product that will do a better job than the old one and to send a report when you've finished. Your teammate B offers an idea of what to do, but you have an idea that you think is better. Teammate C has no ideas at all. What should you do?" The 15 items were created for four different behavioral categories tantamount to the socio-cognitive conflict regulation strategies described in the literature review:

1. *Competitive debating* (4 items), for example, "I try to defend my own explanation at any price".
2. *Quick consensus-seeking* (4 items), for example, "I try to avoid any confrontation between my partner and myself".
3. *Private critical deliberation*, which refers to the critical consideration of different perspectives in a private, non-dialogical manner (3 items), for example, "I re-examine my ideas independently".
4. *Co-constructive, critical peer argumentation* (4 items), for example, "I try to collaboratively examine each idea critically with my partner".

Partial Least Squares Structural Equation Modeling (PLS-SEM; Hair et al., 2017) was used to validate this measurement model. Reliability results ranged from $\alpha = .73$ to $\alpha = .83$. Composite reliability (> .60), ranged from .82 to .96. Average Variance Extracted (*AVE* > .50) range from .55 to .74. The heterotrait-monotrait ratio of correlations (*HTMT*) confidence intervals did not include 1 for each of the constructs. The quick consensus-seeking was not included in the analyses due to low reliability results ($\alpha \leq .60$; Composite reliability = 0.38; *AVE* = 0.39).

### *Concept Mapping for Problem-based Learning Scale (CM-PBL)*

Based on the theoretical framework of concept mapping with a designated decision-making process in a collaborative problem-based activity, a 12-item questionnaire was used (Alt et al., 2022). The

questionnaire aimed to capture students' perceptions of the effectiveness of using collaborative concept maps in the argumentation-based learning process and to assess how it helped them during their decision making in relation to the dilemma. It includes four factors:

1. *Cognitive aspect* – pertaining for example to the extent to which concept mapping helped the students to identify the interrelationships among arguments.
2. *Affective aspect* – measuring the extent to which the students enjoined using concept maps during the activity.
3. *Self-regulation of learning* – being a prominent element of metacognitive reflection.
4. T*ransfer of learning* – assessing the students' willingness to use concept maps in future activities.

Participants were asked to indicate their level of agreement with each of *the statements* shown in Table 1. The items are scored on a six-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (6) (α = .97). A principal axis factoring analysis followed by a varimax rotation was used to corroborate the stability of the scale structure (eigenvalue > 1.00; item loadings > .30). The solution accounted for 88.2% of the variance and yielded the above four categories. One item was omitted due to a low loading result on its ascribed factor.

**Table 1**

*Factor Loading and Reliability Results for Concept Mapping for Problem-based Learning Scale*

| | Factor | | | |
|---|---|---|---|---|
| | Cognitive aspect | Affective aspect | Self-regulation of learning | Transfer of learning |
| **2.** Concept mapping helped me identify the interrelationships among arguments | **.86** | .40 | | |
| **3.** Concept mapping helped me specify interrelationships among arguments. | **.76** | .31 | .32 | .34 |
| **1.** Concept mapping helped me learn about the topic | **.71** | .32 | | .31 |
| **4.** Concept mapping stimulated me to learn and think independently. | .57 | .47 | **.55** | |
| **11.** I liked using concept mapping to assist me in making decisions. | | **.81** | | |
| **10.** I was satisfied using concept mapping in making decisions. | .49 | **.67** | .34 | .32 |
| **12.** I enjoyed using concept mapping during the decision-making process. | .42 | **.66** | .33 | .35 |
| **8.** I will consider using concept mapping in other complex decision-making processes. | .48 | .63 | | **.43** |
| **9.** I will consider using concept mapping to make decisions in the future. | .51 | .62 | .33 | |
| **6.** Concept mapping enhanced my interest in decision-making. | .36 | .49 | **.59** | .37 |
| **5.** Concept mapping helped me to reduce barriers when dealing with decision-making. | .48 | .54 | **.56** | |
| **7.** I think concept mapping can be easily used in other decision-making discussions | .43 | .47 | | **.71** |
| Cronbach alpha reliability results | .95 | .94 | .94 | .93 |

### Data Analysis

PLS-SEM was chosen based on previous work (Hair et al., 2017) showing that PLS-SEM is a powerful method to analyze models using small sample sizes and which overcomes problematic model identifications when small samples are used. Moreover, it should be noted that in situations where it is difficult to meet the strict requirements of more traditional multivariate techniques, such as normal data distribution, PLS-SEM is considered as a preferred method. PLS-SEM has greater flexibility in this respect compared with covariance-based SEM (CB-SEM) when generally making no assumption about the data distribution. Therefore, Data were analyzed by using PLS-SEM (Hair et al. 2017) with SmartPLS 3 software.

## Results

### Descriptive Statistics

Table 2 displays the descriptive statistics of the measured factors. Following the general guidelines for skewness and kurtosis (suggesting that if the number is greater than + 1 or lower than -1, then the distribution is skewed, flat, or peaked, Hair et al. 2017), it can be learned that the distributions can be considered normal, except for two constructs: private critical deliberation and mastery-approach.

**Table 2**

*Descriptive Statistics of the Research Constructs*

| Factors | Sub-factor | M | SD | Skewness | | Kurtosis | |
|---|---|---|---|---|---|---|---|
| | | | | Statistic | Std. Error | Statistic | Std. Error |
| CM-PBL | Cognitive aspect | 4.35 | 1.38 | -0.91 | .30 | 0.41 | .58 |
| | Self-regulation of learning | 4.34 | 1.43 | -0.86 | .30 | -0.04 | .59 |
| | Transfer of learning | 4.17 | 1.50 | -0.71 | .30 | -0.30 | .59 |
| | Affective aspect | 4.14 | 1.44 | -0.79 | .30 | 0.13 | .59 |
| Socio-cognitive conflict regulation strategies | Competitive debating | 4.81 | 0.80 | -0.12 | .30 | -0.60 | .58 |
| | Private critical deliberation | 4.59 | 0.99 | -0.05 | .30 | -1.00 | .58 |
| | Co-constructive, critical peer argumentation | 4.74 | 0.88 | -0.12 | .30 | -0.78 | .58 |
| Achievement Goal | Mastery-approach | 5.52 | 0.67 | -1.34 | .30 | 0.80 | .58 |
| | Mastery-avoidance | 4.59 | 1.04 | -0.29 | .30 | -0.83 | .58 |
| | Performance-approach | 4.77 | 1.19 | -0.99 | .30 | 0.33 | .58 |

*Note*: Concept Mapping for Problem-based Learning (CM-PBL)

It can be learned from Table 2 that of the CM-PBL's sub-factors, the highest mean results were reported for the cognitive aspect and self-regulation of learning sub-factors. Paired sample *t*-tests showed non-significant differences between these variables. Each of them had a significantly higher mean result than the affective aspect construct ($t_{[63]} = 2.70$, $p < .01$; $t_{[63]} = 2.40$, $p < .05$). In addition, the cognitive aspect mean result was found to be higher than the transfer of learning ($t_{[63]} = 2.55$, $p < .05$). Among the socio-cognitive conflict regulation strategies sub-factors, private critical deliberation had the lowest mean result, however, non-significant differences were detected between the factors. Concerning the achievement goal sub-factors, mastery-approach had the significantly highest mean result ($t_{[65]} = 6.95$, $p < .001$; $t_{[65]} = 5.72$, $p < .001$).

**Evaluation of Hypotheses 1 and 2**

PLS-SEM was used to assess hypotheses 1 and 2. Exogenous variables were: CM-PBL (accompanied by its four subfactors), mastery achievement goal construct including two sub-factors: mastery-approach, mastery-avoidance, and performance-approach (performance-avoidance was excluded due to a low-reliability result; see Measurements section). The socio-cognitive conflict regulation endogenous sub-factors were competitive debating, private critical deliberation, and co-constructive, critical peer argumentation. Each of these three sub-factors represents a different regulation strategy, therefore, were separately entered into the model, in line with the research hypotheses. In addition to the paths proposed and illustrated in the conceptual model, two paths were specified from mastery achievement goal constructs and CM-PBL to identify possible indirect effects between mastery achievement goal constructs and socio-cognitive conflict regulation sub-factors via CM-PBL. The initial model included all the background variables (ethnicity, gender, age, FEA, and MEA) to assess how they might contribute to the latent variables; however, Model 2 presents only those which yielded significant coefficient results.

The PLS-SEM analysis used a path weighting scheme and a mean value replacement for missing values. To test the direct effects, we ran the bootstrap routine. Bootstrapping makes no assumptions about the shape of the variables' distribution or the sampling distribution and can be applied to small sample sizes (Hair et al., 2017).

Table 3 presents the results for all initially specified paths. In Model 2 (Figure 2) merely significant paths are indicated. As can be learned from Model 2 (Figure 2) and Table 3, the performance-approach factor was found positively connected to all of the socio-cognitive conflict regulation sub-factors; however, its highest impact was on the competitive debating factor. The mastery achievement goal construct (including mastery-approach, mastery-avoidance) was found non-significantly related to the socio-cognitive conflict regulation strategies. The first hypothesis was, therefore, partially corroborated. In relation to concept mapping, this strategy was found positively connected to co-constructive critical peer argumentation and private critical deliberation. The path between CM-PBL and competitive debating was found non-significant. The second hypothesis was, therefore, partially confirmed. Mastery achievement goal constructs were non-significantly related to CM-PBL.

**Table 3**

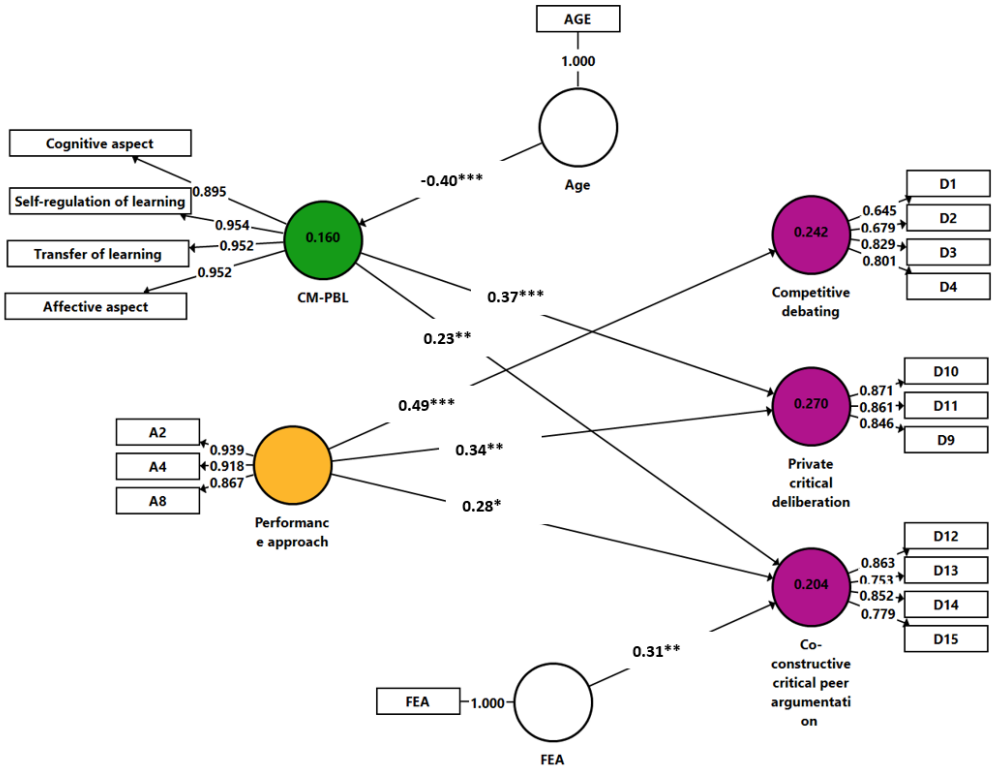
*Significance Analysis of the Direct Effects*

| Path | Direct effect | *t* value |
|---|---|---|
| Age -> CM-PBL | -0.44*** | 3.88 |
| CM-PBL -> Co-constructive critical peer argumentation | 0.23** | 2.23 |
| CM-PBL -> Competitive debating | 0.10 | 0.78 |
| CM-PBL -> Private critical deliberation | 0.37*** | 4.14 |
| FEA -> Co-constructive critical peer argumentation | 0.31** | 2.49 |
| Mastery -> CM-PBL | -0.01 | 0.08 |
| Mastery -> Co-constructive critical peer argumentation | -0.12 | 0.39 |
| Mastery -> Competitive debating | -0.10 | 0.60 |
| Mastery -> Private critical deliberation | 0.03 | 0.19 |
| Performance approach -> CM-PBL | 0.19 | 1.35 |
| Performance approach -> Co-constructive critical peer argumentation | 0.28* | 2.09 |
| Performance approach -> Competitive debating | 0.49*** | 4.62 |
| Performance approach -> Private critical deliberation | 0.34** | 2.68 |

*Note*: Concept Mapping for Problem-based Learning (CM-PBL); Mastery goal orientation (Mastery); father's educational attainment (FEA). $^{*}p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$

**Figure 2**

*Model 2: Analysis Results Generated by SmartPLS*




*Note*: Concept Mapping for Problem-based Learning (CM-PBL); father's educational attainment (FEA). $^{*}p < .05.$ $^{**}p < .01.$ $^{***}p < .001.$

### *Model Evaluation*

The model evaluation included collinearity checks, examined by Variance Inflation Factor (*VIF*) values of all sets of predictor constructs in the structural model. The results showed that the *VIF* values of all combinations of endogenous and exogenous constructs are below the threshold of 5 (Hair et al. 2017) ranging from 1.02 to 1.30. Therefore, collinearity among the predictor constructs was not a critical issue in this structural model. In addition, the coefficient of determination ($R^2$) value was examined, when $R^2$ values of 0.75, 0.50, or 0.25 for endogenous latent variables can be respectively described as substantial, moderate, or weak (Hair et al., 2017). $R^2$ for competitive debating (0.26); private critical deliberation (0.27); and co-constructive, critical peer argumentation (0.22) were found moderate to weak. In addition to measuring the $R^2$ values, the change in the $R^2$ value when a specified exogenous construct is omitted from the model was used to evaluate its impact on the endogenous constructs. This measure is referred to as the $f^2$ effect size when values of .02, .15, and .35, respectively, represent small, medium, and large effects (Cohen, 1988). The highest $f^2$ effect size results were found between CM-PBL -> private critical deliberation (.18), and performance approach -> competitive debating (.31). Finally, the blindfolding procedure was used to assess

the predictive relevance ($Q^2$) of the path model. Values larger than 0 suggest that the model has predictive relevance for a certain endogenous construct (Hair et al. 2017). The $Q^2$ value of competitive debating (0.09) was found relatively low, whereas higher values were indicated for co-constructive critical peer argumentation (0.11) and private critical deliberation (0.17).

## Discussion

This study sought to assess the effect of an argumentation-based learning activity with digital concept mapping on higher education students' socio-cognitive conflict regulation strategies. Another aim was to evaluate the role of achievement goal orientations in explaining these strategies. Our key findings showed that whereas the performance-approach factor was found positively linked to all of the socio-cognitive conflict regulation sub-factors (with the highest impact on the competitive debating factor), the mastery achievement goal construct was found non-significantly related to the dependent variable. Hence performance goals seem to have stronger effects on the conflict regulation strategies. Another finding showed that concept mapping has a higher impact on co-constructive critical peer argumentation and private critical deliberation rather than on competitive debating. Regarding background variables, father educational attainment was found positively linked to co-constructive critical peer argumentation, and younger students tended to perceive the concept mapping activity more favorably.

This study mainly demonstrates that the use of an argumentation-based learning activity with digital concept mapping can positively contribute to students' socio-cognitive conflict regulation strategy of private critical deliberation in which the individual re-examines his/her ideas independently and re-thinks his/her solution independently before taking the next move (Asterhan et al., 2009). A descriptive examination of the factors of the learning activity in the present study revealed that cognitive and self-regulation of learning aspects were more dominant in the activity than other factors based on the students' perceptions. Students reported that the argumentation-based learning activity with digital concept mapping mainly enhanced their interest in the decision-making process stimulated them to learn and think independently and helped them reduce the barriers when dealing with decision-making. These abilities may have enabled them to critically reflect on their decision.

The ability to learn and think independently is frequently associated with metacognitive reflection and self-regulation of learning (Sanders et al., 2019; Stefanou et al., 2013). Regulation is considered a prominent element of metacognitive reflection (Magiera & Zawojewski, 2011), a state in which a person thinks about his/her strategic planning and goal setting and the actions s/he takes in order to learn (Purnomo & Bekti, 2017). Hence, in the field of teaching and learning, metacognition and reflection are deeply intertwined terms and considered essential goals in higher education (Khosa & Volet, 2014). Previous studies indicated the positive effect of regulation skills on students' performance and academic success (Lyn et al., 2011; Zimmerman & Schunk, 2011). The current study adds to previous work by underscoring the importance of self-regulation in an argumentation-based learning activity with digital concept mapping in inducing critical socio-cognitive conflict regulation strategies.

Another strategy affected by the designed learning activity was co-constructive, critical peer argumentation. According to this strategy, the individual attempts to collaboratively examine each idea critically with his/her partner, to have the partner explain his/her ideas more precisely and think together of the best solution. This can be explained by the constructivist approach to learning on which the designed activity was based, which strongly relies on collaboration and negotiation of meaning. Drawing on this approach, the learning activity provided students with multiple perspectives and representations of the content, encouraged them to examine a phenomenon from several perspectives, and forced them to go beyond their common knowledge by developing dialogue and multiple perspectives as well as drawing on available resources (Harfitt, & Chan, 2017). By highlighting the cooperative nature of the learning process

aimed at fostering dialogic thinking (Teo, 2019), and by stressing the dialogic interpretative framework of the pedagogic practice, the students were encouraged to communicate and negotiate the meaning of their solutions.

Nonetheless, although perceived beneficial in relation to cognitive and meta-cognitive aspects, based on the descriptive statistics, the learning activity was less effective in spurring students to transfer concept mapping to future activities. Moreover, the affective level, pertaining to satisfaction of using concept mapping was relatively less conspicuous. Transfer of learning abilities is a central goal of education, concerning the provision of learning experiences that are useful beyond the specific conditions of initial learning (Lobato, 2012). The relatively low mean result reported by the participants regarding their ability to transfer the concept mapping skills can be explained by their lack of deep-initial learning of the tool, as this was their first experience with the tool (Chi & VanLehn, 2012). In relation to the affective aspect, our results can be explained by several researchers (Ching & Hsu, 2011; Liu et al., 2021; Rye et al., 2013) who pointed to barriers in adopting and using collaborative digital concept mapping, for example, lack of students' proficiency in the targeted technology, lack of student learning motivation; or students' low level of collaborative perception. Therefore, teachers should consider integrating concept mapping into lesson plans to strengthen students' ability to easily use it and consider ways to mitigate the technological barrier by identifying students who struggle with technology and designing adaptive instructional scaffolding in interactive learning environments.

Regarding the motivational achievement goal variable, the highest impact of the performance-approach factor was on the competitive debating factor. This can be explained by previous findings showing that performance-approach goal-oriented students, who focus on the interpersonal dimension of a disagreement, tend towards competitive conflict regulation because they are oriented toward establishing their own superiority and perceiving people who disagree with them as opponents (Butera et al., 2019; Sommet et al., 2014; Sommet et al., 2015). Indeed, performance goal orientations have several merits, as put forward by Senko et al. (2011). Students should possess a certain amount of performance goals in addition to being interested in the subject matter. Yet, in line with our hypotheses, this internal condition that some students use to monitor their learning might lead to poor conflict regulation strategies. It should be noted, however, that contrary to our expectations, the mastery achievement goal construct was found non-significantly related to the conflict regulation strategies. This insight highlights the need to provide adapted feedback for different groups of students. In practice, teachers should place emphasis on both shared goals and individual accountability to improve collaborative knowledge construction (Gašević et al., 2019; Koc, 2012). This may necessitate identifying low-performing or dysfunctional groups, moderating discussions, emphasizing the link between collaboration and course expectations, contents, and outcomes, helping learners align their personal interests towards those outcomes.

Concerning background variables, father educational attainment was found positively linked to co-constructive critical peer argumentation. This finding can be supported by several researchers who claimed that parental educational level is an important predictor of children's educational, behavioral (Dubow et al., 2009), and socio-emotional (Kiang et al., 2004) outcomes. Finally, students' age was found connected to the way they perceived the concept mapping activity; younger students tended to perceive the concept mapping activity more favorably. A possible explanation for this might be that age can be related to technology readiness (Blut & Wang, 2020), information skills, and digital technology usage (Kaarakainen et al., 2019). Chiu et al. (2019) suggested strategies that can be adopted in the teaching process to help elderly who struggle with new technology. These include, for example, overcoming physical barriers by repeated practices, and creating a peer-learning environment.

## Limitations and Directions for Future Research

The present work features both limitations and directions for future research that warrant mentioning. First, future research should consider expanding the model tested herein with additional variables that might explain conflict regulation, such as emotions, or co-regulation (Hadwin et al., 2018), and examine how they might affect collaborative problem-solving (Avry et al., 2020). Second, the self-reporting measures used in this study raise the necessity to employ more diverse methods, such as qualitative techniques, to lend more confidence to the conclusions regarding the connections between the research factors. Moreover, future studies may further benefit from an alternative measure that focuses more specifically on observed behaviors. For this purpose, approaches such as participatory design research might have the potential to substantively elaborate the current study's findings. Third, the mastery approach of achievement goal orientation was found non-significant in explaining collaborative and critical strategies of conflict regulation. Therefore, larger population studies are needed to validate *the* findings, and more research on this topic needs to be undertaken to establish the associations between these constructs. Fourth, our sample included 83% women. Indeed, undergraduate research pools can be overrepresented by women (Dickinson et al., 2012), nonetheless, future studies need to find ways to mitigate gender imbalances by increasing the number of male participants. However, it may come at the cost of non-representativeness. Finally, a longitudinal study design should be used to repeatedly assess the variables discussed in this study to detect any changes that might occur before and after the proposed activity. Moreover, the current intervention should be compared to other instructional activities, bearing similar learning outcomes, to evaluate whether the benefits of the current learning activity surpass those of others, such as emotion regulation training (Van Doren et al., 2020), perspective-taking (Newton & Zeidler, 2020), or integrative negotiation (Chapman et al., 2017).

## Conclusions and Implications

The following tentative conclusions, which necessitate further research, might be proposed. Individual differences in achievement goals were mainly studied thus far in an individual context, through a pure relationship between an individual and a task (Darnon et al., 2007). This research elaborates the scant number of studies that provide empirical support for the theoretical hypothesis stating that achievement goals might be differentially related to perceived behavioral patterns in conflict regulation. The present study proposes that achievement goals might be aligned with how students perceive their behavior during social interaction. Given this plausible association, teachers may want to consider ways in which these achievement goals can be manipulated through goal instructions. Goal instructions might affect peer discourse, to some extent, and might steer students towards more collaborative conflict regulation techniques (Butera et al., 2019).

Most importantly, our study suggests that argumentation-based learning activities supported by digital concept mapping are likely to be positively connected to socio-cognitive conflict regulation strategies, such as collaborative and critical strategies, over and above individual differences. It is plausible that the designed activity helped the participants understand the structure of an argument and thus recognize the importance of providing evidence and supporting facts to substantiate the reasoning put forward to support their position. This process may have led some to realize that there may be a discrepancy between their existing knowledge and another's point of view, thus raising doubts about the validity of one’s own point of view which was required to establish his/her position. This process provides learners with an opportunity to re-examine their ideas and appreciate formally and semantically sound arguments.

With the growing attention paid to conflict situations between or among individuals, groups, organizations, and nations (Wallensteen, 2019), the contribution of the current study lies in its identification

of individuals' motivations to embrace a strategy to resolve conflict situations. Although centered on higher education learning settings, this study's insights are relevant also to other environments, such as workplaces (Kazemi et al., 2022). Mitigating workplace conflicts is important, given the negative effects such conflicts can have on individuals. This study underscores the importance of equipping individuals with a set of skills that enables them to effectively regulate conflicts by engaging them in socio-cognitive argumentation activities during their educational processes aimed at nurturing their lifelong learning skills. These processes may raise their awareness of more collaborative strategies of regulation when faced with different types of conflict situations

However, a single instructional intervention might be insufficient to substantiate these conclusions. Indeed, conflict regulation skills can be nurtured when refined through programs of recurrent practice in dialogic argumentation (Asterhan & Schwarz, 2016). Yet, to achieve this goal, special attention should be devoted to the design and implementation of the activity with a focus on the process and intended learning outcomes.

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## Author Bios

Prof. Dorit Alt. Dean of the faculty of education, Tel Hai College, Israel, is specialized in the field of instruction, learning, and assessment in the 21st century. Her research work centers on promoting lifelong learning skills by formal and non-formal learning environments. Among her numerous publications are the following books: *Lifelong citizenship: Lifelong learning as a lever for moral and democratic values*; *The challenges of academic incivility; Equity and formative assessment in higher education: Advancing culturally responsive assessment.*

Dr. Yoav Kapshuk is a lecturer at Kinneret College on the Sea of Galilee, Israel; Head of Israel Studies Unit at the department of Multidisciplinary Studies. Former Visiting Fellow at the LSE Middle East Center, and at the Peace Research Institute Frankfurt. Dr. Kapshuk focuses on peace research: peacebuilding, peace education, peacemaking and transitional justice, especially about the Israeli-Palestinian conflict and Israelis and Palestinians relationships. He received his Ph.D. in Political Science and International Relations from the Tel-Aviv University (2017). Dr. Kapshuk won the 2018 Best Doctoral Thesis Award from the Israel Political Science Association (IPSA) and the 2018 Best PhD Paper Award from the Israeli Association for International Studies (IAIS).