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Linking knowledge justification with peers to the learning of social perspective taking

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ABSTRACT

The purpose of this study was to examine whether justifying one's own social knowledge (moral, societal, psychological) toward complex social-moral issues through collaborative argumentation was associated with the improvement of social perspective taking for elementary students. A total of 129 5th graders (52% female, Mage = 10.98) from six classrooms in two public schools participated in six weekly collaborative small-group discussions to reason about complex social-moral issues such as social exclusion. Two aspects of knowledge justification were examined: the frequency of knowledge justification and the diversity in perspectives. A Poisson regression with Generalized estimation equation (GEE) revealed that frequency of knowledge justification and diversity in perspectives during collaborative argumentation were associated with pre-post changes in students' social perspective taking, as reflected in individual essays. Findings underscore knowledge justification as a potential mechanism of collaborative argumentation to promote elementary students' social perspective taking.

KEYWORDS

Elementary students; collaborative argumentation; social perspective taking; knowledge justification; diversity in perspectives

Social perspective taking (SPT), the ability to understand others' thoughts and feelings in relation to their actions (Diazgranados et al., 2016; Gehlbach et al., 2008) reflects individuals' concerns about 'what are you going through?' (Noddings, 2002, p. 17), promoting a more empathic human connectivity (Ackermann, 2001). SPT is often considered to be at the core of social-emotional competencies, helping us become part of an engaged and responsible citizenry (Gibbs et al., 2009; Toledo & Enright, 2021). Current civic education initiatives often do not take social perspective taking into account, choosing instead to focus on direct instruction (Althof & Berkowitz, 2006; Lee, 2021; Lickona, 1991). While direct instructions on individual characteristics does have its virtues, it can be limited in helping students appreciate and navigate divergent perspectives to enhance SPT; SPT might best be nurtured through intentional educational processes.

When individuals come together to construct and critique available information/knowledge through collaborative argumentation, the process offers potential for

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enhancing SPT while reducing Myside bias or confirmation bias (Kuhn & Udell, 2003; Reznitskaya et al., 2009). However, the majority of collaborative argumentation studies to this point tend to focus on specific learning outcomes, giving relatively less attention to underlying processes of change (e.g., Asterhan & Schwarz, 2016). Few have studied the ways specific perspectives of knowledge and their coordination might drive learning mechanisms. Developing a greater appreciation for the how and why of collaborative argumentation and its effective use in fostering students' SPT is a critical next step.

The present study takes a social constructivist orientation (Vygotsky & Cole, 1978); students' social knowledge initially develops and then grows through communication and co-construction of critical knowledge with others (Glassman et al., 2022; Schwarz & Shahar, 2017). Productive shared social dialogue can lead to, and even demand students' active adoption and coordination of diverse perspectives, triggering a more comprehensive understanding of problems (Turkle & Pappert, 1991). Contextualized within peers' discussion of social moral content, this study examines how collaborative argumentation can serve as an optimal learning context for improvement in elementary students' SPT, bridging existing gaps within the fields of social moral development and collaborative argumentation by examining how elementary students' justifications of social knowledge, especially across diverse perspectives, lead to improved SPT. Exploring which perspectives of multifaceted social moral phenomena students tend to focus on more frequently when justifying their positions and arguments within three levels of abstraction in social knowledge (i.e., moral, societal, personal-relational perspective) will help us gain a better understanding of how students reason about complex social moral issues.

Literature review

Social perspective taking

Social Perspective Taking (SPT) develops through social interactions and often involves complex social reasoning and human relations (Diazgranados et al., 2016), and has been found to be positively associated with social outcomes, such as the abilities to negotiate and communicate effectively with others (Galinsky et al., 2008) and to engage in cooperative and altruistic behaviors (Batson et al., 1997). Research on the development of SPT can be traced back to Selman's (1981) Piagetian inspired constructs of social reasoning and decision making. Piaget (1963) suggested that human cognition follows a scheme of development ranging from preoperational, to concrete operational, and to formal operational. Building on these seminal theories, Selman (1981) argues that "the extent to which a child reflectively understands the coordination of multiple social perspectives, both intrapsychically (within the self) and interpersonally (between self and others), reflects an underlying structure of social thought identified as levels in the coordination of social perspectives." (pp. 405–406). This model is often associated with the more individual-oriented approach to the development of social thinking. Other approaches to SPT focus more directly on emotions and a caring orientation in social decision making. One's disposition and capacity to feel for others (i.e., affective empathy) plays a pivotal role in achieving a better understanding of people and their immediate and distant needs especially when confronted with difficult or even painful circumstances.

In spite of their differences in foci, both approaches acknowledge the legitimacy and effectiveness of dialogue and conversations in achieving understanding of others (Blatt & Kohlberg, 1975; Noddings, 2010). The presence of others in social dialogue provides valid social inputs necessary for cognitive coordination across perspectives (Damon & Killen, 1982; Mason & Gibbs, 1993), and creates contexts and conditions conducive to modeling, practicing, conversing about, and confirming the types of 'caring' that triggers SPT development (Noddings, 2010). A central question is what type of educational intervention should we (and can we) devise that would trigger the use of SPT as a tool in social awareness and problem solving.

Collaborative argumentation as a context for multiple perspectives

Collaborative argumentation involves intellectual and social efforts of two or more people coordinating multiple lines of reasoning toward the most plausible and legitimate outcomes/solutions to a problem (Chinn & Clark, 2013; Nussbaum, 2008). Just as inner speech and reflection arise from the inter-relationships between a child and other(s), the child's motivation to act on a problem also comes from inter-relationships (Vygotsky & Cole, 1978). Social interactions in a group during collaborative argumentation can provide meaningful input challenging members of the group to expand their social awareness and reasoning skills (Kuhn, 2019; Lin et al., 2022).

Justification of social knowledge

At the core of collaborative argumentation lies multiple layers of possible learning, including abilities to access and articulate one's inner thoughts using proper evidence in a communicable form, that is, justification. Productive collaborative dialogue begins with introducing a claim, a standpoint, or a position about the issue at hand. Students then collectively examine the validity, acceptability, and plausibility of the claim using explanations, evidence, or reasons (Nussbaum, 2008). The process of justifying one's claim involves high-level cognitive engagement (Scott et al., 2010; Tenenbaum et al., 2020). In this type of collaborative argumentation, students continually attempt to reason with their peers by verbalizing their inner thoughts (Michaels et al., 2010). Over time, they become more capable of producing knowledge through a dialogic process (Michaels et al., 2010). As they consistently practice justifying their positions, they will create a metacognitive awareness of what they know and what others know (Kuhn et al., 2013), leading to a greater understanding of multiple interlocutors' thoughts and feelings, which is SPT. Over time, this dialogic means by which students learn to take perspectives of others is expected to advance their exploration and understanding of complex social issues (large and small).

Exposure to multiple perspectives and justifications by peers

Productive collaborative argumentation exposes students to multiple perspectives of peers. When students interact with peers who are different in their achievement levels, cognitive functioning, levels of knowledge, and sociocultural backgrounds, they experience new perspectives of thinking. They come to understand that effective problem solving occurs when various perspectives are considered (Vygotsky & Cole, 1978). Collaborative argumentation challenges students to consider alternative possibilities

and solutions, recognizing the need to coordinate and integrate unique perspectives on given topics if they are going to have any chance of developing common solutions (Berkowitz & Gibbs, 1985).

Justification of knowledge across multiple perspectives

When students are exposed to multiple perspectives, they are more likely to consciously regulate their own thought processes in the public arena as they shift from one perspective to another, negotiating differences within the group and pushing students to move beyond their current developmental capacities for perspective taking. Students pushing their competencies to reason about a topic in dialogue, across distinct perspectives, can help them recognize and learn the importance of other people's views, thoughts, and emotions in social decision-making, eventually making their idea formulation and knowledge construction processes flexible, contextualized, and fragile (in a good sense) (see Papert, 1980 as cited in Ackermann, 2001). The extant literature calls for a need to consider students' ability to switch across and coordinate perspectives within moral dilemma discussions and argumentative discourse (see, Mischo, 2005).

The ladder of abstraction in students' perspectives on social-moral issues

Students' perspectives on social-moral issues, when co-constructed through collaborative argumentation, can range from the more abstract to the more concrete (Thoma, 2014). During collaborative argumentation, students may consider the issue from the moral perspective, the societal perspective, and the personal-relational perspective. In this study, we refer to these perspectives as a ladder of abstraction. Informed by the neo-Kohlbergian model along with other moral theorists (e.g., Noddings, 2010; Pečujlija et al., 2011; Rest et al., 1999), the current study assumes that students' understanding of an ambiguous social-moral issue might be dependent on where their thinking falls along this ladder.

The moral perspective is the most abstract, the furthest removed from the contextualized problem and the individual struggling with the specific problems. It suggests solutions should be based in some greater, shared belief system or doctrine that transcends individual and even societal perspectives, similar to Kohlberg's post conventional stage. It is usually associated with virtues and principles that are obligatory, unalterable, normatively binding, and universal, such as liberty, fairness and honesty. Such moral principles are typically regarded as higher order approaches to social problem solving eclipsing the particularities of situations or contexts (Agerström & Björklund, 2013); they pertain to the abstract representations as end-goals (Torelli & Kaikati, 2009), implying the abstract element of social decision making should take precedence.

The societal perspective foregrounds the rules and systems of the social group (local or general) including authority, traditions, norms, and expectations that are bound in the context of a unique social system. Examples of societal perspectives include cultural values, family responsibility, school rules, or peer group norms (Kohlberg, 1976). These examples can be understood well within the adolescent stage as suggested by Gibbs et al. (2013). In this adolescent stage, individuals' social moral reasoning mainly relates to mutual trust (e.g., social contract) and fair treatment, advancing beyond a pragmatic focus (Bajovic & Rizzo, 2021). Given that social norms, expectations, and traditions may contain both abstract (e.g., good student) and concrete forms (e.g., three tardies marked

as an absence) depending on contexts, the societal perspective is posited as midpoint within the ladder of abstraction.

The personal-relational perspective pertains to students' justifications focusing on emotions, individual needs, motivation, or personal and private concerns. This is often equated with the preconventional level of the stage theory, in which individuals are mainly concerned with their own interests and needs (Snarey & Samuelson, 2008). However, the personal-relational perspective's lower placement on the ladder of abstraction does not necessarily indicate that it is at the lower bounds of moral development. Emphasis on the affective components of a moral problem, the role(s) of current and future relationships, and the importance of understanding specific contexts can be just as or even more salient than societal or moral considerations when trying to navigate difficult social issues/problems (Noddings, 2002). Seemingly less formal and abstract lines of thoughts with a more situated approach to reasoning can be more valid and appropriate depending on situations (Ackermann, 2001; Papert & Harel, 1991). Reasoning based on concrete, local, and personal aspects of a social problem can help a decision maker 'travel through a world' (Ackermann, 2001, p. 10) that demands workable, caring solutions in the here and now.

To better understand how students' perspectives on social-moral issues can be varied along the ladder of abstraction, we highlight examples related to the story *Bat 6*, a fictional short story employed in the current study. The story introduces two girls, Aki and Shirley. Aki, a Japanese girl, is bullied by Shirley because she is a Japanese. On the other hand, Shirley, an American girl whose father died at the hands of Japanese soldiers during World War II, feels hurt and mourns about her father's death and mother's subsequent pain. Shirley hates Aki and bullies her physically and emotionally. With a socially and morally complex question, 'Should Aki forgive Shirley?' students discussed collaboratively as a group, trying to justify their arguments with reasoning. Their arguments were then evaluated within the ladder of abstraction as shown in Table 1.

Table 1. Examples of ladders of abstractions demonstrated in a Collaborative Social Reasoning (CSR) discussion (Bat 6 story).

Perspective	Examples
Moral perspective mainly concerns 'what is right'	
Justice	*'**It's not Aki's fault** that what happened to Shirley's dad, . . . '*
Fairness	*'It's not **fair** for Aki to get blamed on . . . '*
Moral transgression	*'Of course it wasn't an accident. She **did it on purpose** because . . . '*
Societal perspective mainly concerns 'what is appropriate'	
Social roles	*'I think the reason to forgive people is maybe it's with your **friend** and . . . '*
Social approval	*' . . . They couldn't because **part of her friends still think Japanese people are bad**.'*
Social norms	*'Shirley didn't shake Aki's hand .**What she did was really not good sportsmanship**.'*
Cultural and conventional ideas	*'**Why would you apologize if** somebody came up .?'*
Personal-relational perspectives main concerns 'what they need'	
Story characters' emotions	*'I think she should because **she would be sorry** if . . . '*
Individual needs	*'she still misses her dad and she's only a little girl, so **she still misses him**, and that's because it's a physical emotion'*
Personal concerns	*'I wouldn't be their friend even if they said sorry **because that hurts you**.'*

The current study

The central thesis of this study was that students would show improved SPT by engaging students in productive, dynamic, and meaningful collaborative argumentation with peers in which they generate and justify multiple perspectives spanning the ladder of abstraction. We hypothesized that collaborative argumentation about complex social moral issues (e.g., discrimination) can be effective in enhancing elementary students' SPT through the multi-layers of learning processes where students articulate their argumentation (i.e., justification), are exposed to multiple perspectives of others (i.e., peers' diverse perspectives), and coordinate their arguments across diverse perspectives (i.e., individuals' diverse perspectives).

The current study utilized the rich video-recorded discussion data collected from the Lin et al. (2022) study. The original study was conducted in a small-group discussion context called Collaborative Social Reasoning (CSR) (Lin et al., 2022). The design of CSR discussions was built upon extensive literature of Collaborative Reasoning (e.g., Reznitskaya et al., 2009), a student-centered, teacher-facilitated approach designed to stimulate critical thinking and intellectual development. In a CR/CSR discussion, students work in small groups to collaboratively argue about complex issues. Students talk freely without raising their hands, and the teacher plays the role of facilitator, providing cognitive support (e.g., prompting for the use of evidence) and social support (e.g., encouraging turn taking) to students when necessary. The CSR approach particularly focused on building social moral knowledge upon students' personal and sociohistorical roots (Rogoff et al., 1995), such as emotions and caring (Noddings, 2010). With that, the current study carefully selected social moral topics that were prevalent in students' daily life (e.g., peer exclusion) and arose from age-appropriate literature.

Data of the current study contained a corpus of discussion transcripts and videos. The following aspects of knowledge justification were postulated and investigated as possible progenitors of increasingly complex use of SPT, including: [1] the frequency with which students justified their claims, standpoints, or positions on social moral topics according to the ladder of abstraction (moral, societal, personal-relational), and [2] the degree to which students' knowledge justification spread across diverse perspectives at the individual level as well as the group level (i.e., individual diversity in perspectives, group diversity in perspectives). We operationalized students' diversity in perspectives as the extent to which students' justifications were tied to diverse/multiple perspectives (i.e., moral, societal, personal-relational) as opposed to relying on a single perspective, with higher values representing more coordination across diverse perspectives in a balanced manner.

Three research questions were examined: [1] Do students who generate more knowledge justifications during CSR discussions demonstrate greater SPT? [2] Do students' diversity in perspectives at the individual or group level during CSR discussions relate to changes in SPT? [3] How does each of the three social-moral perspectives relate to changes in SPT? We hypothesize that [1] students who generate more knowledge justifications would show greater learning in SPT; [2] students who generate knowledge justification by constantly shifting their perspectives on social-moral issues from concrete to abstract level (i.e., greater individual diversity in perspectives) and those who were exposed to peers' perspectives that represented a fuller ladder of abstraction (i.e.,

group diversity index) would show greater learning in SPT; and [3] all three social-moral perspectives (moral, societal, personal-relational) would be equally predictive of changes in SPT based on the study assumption that different perspectives play unique roles in collaborative argumentation, and no particular perspective is inherently superior to the others.

Method

Participants and corpus of data

This study was based on a subset of data drawn from a larger quasi-experimental study (Lin et al., 2022) designed to investigate the influence of collaborative small-group discussions on students' academic and social competencies. For the purpose of this study, we only included the experimental classrooms, which contained 24 small groups from six classrooms (129 students; 66 females) from two schools. Among these students, 33.3% were White, 23.3% were Black, 21.7% were Hispanic, 2.3% were Asian, and 19.4% were others.

Students engaged in six CSR discussions throughout the intervention. Each small group participated in one discussion per week for six consecutive weeks. The second, fourth, and sixth discussions from each small group were transcribed and analyzed in this study, totaling 72 CSR discussions. Each discussion lasted for 25 minutes on average (SD = 7.97). In total, the discourse corpus contained 7,531 turns of speaking from students and 2,094 turns of speaking from the teachers. Only students' talk was used for analyses.

Collaborative Social Reasoning (CSR) intervention

Six multi-faceted fictitious stories at the fifth grade reading level were selected for the study. The issues raised from the stories were provocative and shared the themes of social exclusion and social justice. Stories in Discussion 1, 3, and 5 were excerpted from contemporary fiction. Stories for Discussion 2, 4, and 6 were excerpted from historical fiction. These stories were ordered by reading level. Given the labor-intensive coding process, only discussions based on historical fiction were analyzed in this study: *Bat 6* (Wolff, 2015), *The Gold Cadillac* (Taylor, 1998), and *Dovey Coe* (Dowell, 2000). The story *Bat 6* focused on the dilemma of one Japanese girl's forgiveness toward a bully, whose hateful acts stemmed from her father's death at the hands of Japanese soldiers. *The Gold Cadillac* dealt with an African American father's decision to drive his luxury car to the South during the 1960s, with the internal conflict between standing up for his right to drive the car versus protecting his family from racial discrimination. *Dovey Coe* focused on a girl's internal conflict about telling the truth or protecting her brother who accidentally committed the crime.

Each small group was heterogeneous in terms of gender, achievement levels, and social skills based on teachers' input on each student's academic and social characteristics. Prior to the small-group intervention, teachers and students learned about CSR norms through a whole-class discussion after watching and reviewing a video of an exemplar small-group discussion. Each week, students read a story before the CSR discussion. The

discussion began with a teacher-guided goal-setting activity where group members developed and shared group goals. The teacher then announced the 'big question,' a central issue concerning the social-moral dilemmas in the story. Prior to the small-group intervention, teachers and students learned about CSR norms through a whole-class discussion after watching and reviewing a video of an exemplar small-group discussion. Students were encouraged to derive the most reasonable solutions to the issues together. Students were also encouraged to share ideas freely, (dis)agree with opinions rather than people, and create equitable opportunities for everyone to participate in the discussion.

Measures

Social perspective taking

Reflective essays. To assess students' social perspective taking, we asked students to read a short story and subsequently address a complex social issue arising from the story (e.g., bullying, social exclusion) in an essay. Pre-assessment essays were collected at the beginning of the Spring semester (January) and post-assessment essays were implemented immediately after the CSR intervention (March). Two stories were adapted from contemporary fiction stories, and the story order between the pre- and post-tests was counterbalanced within classrooms. The 'Super-Sized Slugger' story was adapted from *Super-Sized Slugger* (Ripken & Cowherd, 2012), which dealt with bullying problems in an eighth-grade baseball team. Cody is a new student in school who is teased by peers for being overweight. He is talented for baseball but must compete for the third base position in the school baseball league against Dante, a school bully who threatens to hurt Cody if he loses the position to Cody. The writing prompt was 'Should Cody tell on Dante?' The 'Private!' story, adapted from *The Daily Dilemma by Charis* (Denison, 2002), focused on the dilemma of a new student, Lily, who finds that her group of new friends uploaded nasty photos of a classmate in a private online group. The writing prompt was 'Should Lily report the post?'

Coding SPT from reflective essays. The SPT coding scheme we developed (Wen et al., 2023) integrated the social-relational view of SPT (Diazgranados et al., 2016) and the framework of argumentation (Reznitskaya et al., 2009). The coding scheme focused on two facets: 1) Students' abilities to identify and justify different perspectives from various social entities (e.g., protagonist, small group peers), and 2) the ways by which students justified the social entities' perspectives (e.g., analogical reasoning, value-based reasoning). For the purpose of this study, we used the perspective codes to represent students' SPT.

The perspective codes consisted of two sub-categories, *recognized perspective* and *justified perspective. Recognized perspectives* refer to the number of story characters which the student distinctively mentioned in the essay without justification (e.g., 'I think Cody should tell on Dante.'), including story protagonists (e.g., Lily), social groups (e.g., team), and other characters related to the story protagonists (e.g., mother). *Justified perspectives* refer to perspectives that were recognized and justified with claims, which were students' assertions about story characters' thoughts or feelings (e.g., 'I think Cody should tell on Dante because Dante was making fun of him over a spot on the field and Dante called him fat boy.').

SPT outcome index. Based on the above coding, we derived at a weighted SPT index: justified perspectives × 2—recognized perspectives × 1. This weighted SPT index was designed to appraise students' ability to justify their perspectives and penalize unjustified perspectives. Two trained graduate student researchers independently coded 20% of the essays randomly selected from the data set. The kappa values were satisfactory for each category (Recognized Perspective, $\kappa = .83$, Justified Perspective, $\kappa = .84$). Wen et al. (2023) reported that compared to the control comparison groups, the change in SPT in the CSR group was significantly greater ($ps < .001$).

Knowledge justification

Coding knowledge justification from discussions. To assess students' procedural learning mechanisms underlying collaborative argumentation, students' knowledge justification was measured following these steps. First, the 72 videos of CSR discussions were transcribed and coded for knowledge justification, or statements containing meaningful reasons or evidence to support a claim about the social-moral issue. The unit of analysis was turns of speaking, defined as sentence(s) from a speaker that ended prior to the next speaker and contained a complete meaning. Speaking turns that fell under one of the following criteria were not coded for knowledge justification: (a) turns with a claim, position, or question related to the big question without any supporting reasons ('Aki should forgive Shirley.'), (b) turns that were uninterpretable or incomplete ('I think . . . [pause]'), (c) egocentric or off-task utterances ('I am scared I'm gonna get a D.'), (d) turns that merely summarized or paraphrased stories without reasoning ('Yeah it even said here in page seven that like that one of their um uncles and stuff said that they're gonna-if you go down south they're going to lynch you.'), (e) short utterances for correction or clarification (A: 'So you're saying that a little kid CAN bomb?' B: 'Can't.'). Additionally, if students showed their agreement or disagreement toward the reason(s) generated by the previous speaker, the (dis)agreement was assigned the same social knowledge codes as the code assigned to the previous speaker's utterance. The rationale was that the (dis) agreement revealed the alignment of thought between the current and the previous speakers (A: 'Honestly if someone killed your little brother, you want the murderer to pay, right?' B: 'I agree with you, A.').

About 35.6% of total speaking turns contained knowledge justification and thus were further coded into topics and perspectives. The topic codes captured the topics of knowledge that students generated in relation to their claims. Two coders iteratively examined the transcripts and identified five topics that were commonly referred to by students when justifying their positions or claims: friendship, social exclusion, prejudice, bullying, and responsibility (see, Table 2 for the coding scheme). A turn of speaking that was assigned a topic was also coded for a knowledge perspective according to the ladder of abstraction (moral, societal, personal-relational) underlying students' knowledge justification. A turn of speaking was coded as a moral perspective if it involved consideration of moral virtues and principles, the societal perspective if it involved consideration of authorities, traditions, societal norms and expectations, or the personal-relational perspective if it involved consideration of individual needs, thoughts, motivation, emotions, or personal concerns. Two researchers independently proceeded with the coding subset of the transcripts (20%) that were randomly selected for reliability check.

Table 2. Social knowledge justification coding scheme.

Topics/ Perspectives	Description	Examples	Cohen's *K*
Dimension 1: Topics of Knowledge			
Friendship	Expectations of how a friendship should proceed	Shirley's teammates shouldn't tell on her for punching Aki because **it's bad to snitch on friends**	0.78
Social exclusion	Different treatment or exclusion from a group because of a social category to which a person belongs	The father should be allowed to drive his car to the south because **cops shouldn't treat them differently just because they're Black**	0.87
Bullying	Physical or psychological actions that cause harm to others	It is the school rule that **students can't do name calling**. If they do, they might get in trouble.	0.84
Prejudice	Beliefs about a certain group of individuals	Because she is poor, there's a possibility that no one will believe her.	0.90
Responsibility	Accountability for proper consequences that people deserve for their wrongdoing, offense, or transgression	If someone killed your little brother or sister, **you would want them to pay for it**, and you would want the murderer to **get their consequences**.	0.91
Dimension 2: Perspectives of Knowledge			
Moral	Pertaining to moral values such as justice, fairness, and rights.	Dovey needs to tell on her brother because **killing people is wrong**	0.72
Societal	Pertaining to authority, tradition, norms, and expectations within social systems	Shirley shouldn't punch Aki because it is against the school policy	0.87
Personal-relational	Pertaining to the idea of self, such as privacy, personal choices, and preferences	I think it's okay for the Dad to buy the car because **it makes him happy**	0.86

The inter-coder reliabilities were satisfactory for both topics (Cohen's K = .78-.91) and perspectives (Cohen's K = .72-.87).

Diversity in perspectives

Two diversity indices, individual diversity index and group diversity index, were developed based on the formula created by Simpson (1949) and adapted by Munniksma et al. (2017). Individual diversity index refers to the level at which individual students are able to justify knowledge from multiple perspectives varied according to the ladder of abstraction. This was operationalized as 1 minus the squared ratio of the student's most frequently generated perspectives in their knowledge justification. For example, a student generated ten knowledge justification turns; three of them were classified as moral perspectives, three coded as societal perspectives, and the remaining four as personal-relational perspectives. This student's most frequently generated perspective was personal-relational perspective and the squared ratio is 0.16 (= $(4/10)^2$). The individual diversity index is therefore .84 (=1–0.16). Another student generated the same number of knowledge justification but with less diversity in perspectives—five in societal and five in personal-relational perspectives. The second student's individual diversity index is .75 (= $1—(5/10)^2$), which is lower than the first student's.

Using the same formula, we developed the diversity index at a group level, reflecting the extent to which the total number of knowledge justification by group members was balanced in their perspectives according to the ladder of abstraction (moral, societal, personal-relational). The group who justified their knowledge in exclusively one perspective would yield the lowest group diversity index.

Covariates

Students' individual backgrounds such as gender, race, family resources, and achievement levels were used as covariates in this study, predicated on previous studies showing possible linkage between individual characteristics and SPT (Mischo, 2005; Taylor et al., 2019). Students' standardized test scores were used for achievement levels. To assess family resources, a proxy of socioeconomic status, eight yes/no questions (e.g., access to wireless internet) and four multiple-choice questions (e.g., frequency of going to movie theaters) about family resources and leisure activities were adapted from Boyce et al. (2006). Responses to the multiple-choice questions were converted into binary codes where '1' corresponded to a student response that was above the mean. A composite score was calculated for each student based on the sum of the 'yes' responses and the code of '1' on the 12 items (max = 12).

Results

Descriptive analyses

As shown in Table 3, students generated more knowledge justification based on societal perspectives (M = 8.71, SD = 7.99), followed by personal-relational perspectives (M = 8.39, SD = 6.29). The amount of knowledge justification based on moral perspectives students generated during discussions was noticeably lower than societal or personal-relational perspectives (M = 2.26, SD = 2.12). Table 4 reports the descriptives of weighted SPT scores at pre- and post-tests. Table 5 shows that individual students' total knowledge justification was significantly correlated with that of peers in the group (r = .45, p < .001). Peers' total knowledge justification was calculated by subtracting individual students' knowledge justification from the total knowledge of the group to which each student belonged. Frequency of knowledge justification was correlated with diversity in perspectives at the individual level (r = .31, p < .001) but not at the group level (r = –.07). The diversity in perspectives at the individual and group levels were correlated (r = .35, p < .001).

Table 6 shows the patterns of knowledge justification based on the three social-moral perspectives varied along the ladder of abstraction. Most students who generated knowledge justification did it by considering all three perspectives throughout the three CSR discussions (75.97%). Some students relied on two perspectives only (17.83%), with most of them not considering moral perspectives (17.05%). About 3.1% of arguments were exclusively based on personal-relational perspectives.

Table 3. Means and medians of knowledge justification generated by individuals or groups for each discussion and across three discussions.

	Individual		Group	
	Mean (*SD*)	*Median* (Range)	*Mean* (*SD*)	*Median* (Range)
Total Knowledge Justification	19.35 (13.74)	17 (1 ~ 76)	105.61 (51.775)	95 (39–236)
Week 2	5.70 (5.24)	4 (0 ~ 32)	31.66 (1.08)	33 (3 ~ 79)
Week 4	7.57 (6.07)	7 (0 ~ 31)	40.77 (20.45)	39 (16 ~ 92)
Week 6	6.09 (6.53)	4 (0 ~ 36)	33.03 (24.17)	28 (3 ~ 98)
Moral Knowledge Justification	2.26 (2.12)	2 (0 ~ 10)	12.65 (7.97)	13 (3–33)
Week 2	0.78 (1.27)	0 (0 ~ 7)	4.39 (3.67)	3 (0 ~ 11)
Week 4	0.55 (0.98)	0 (0 ~ 4)	3.01 (3.49)	2 (0 ~ 15)
Week 6	0.93 (1.35)	0 (0 ~ 7)	5.26 (4.95)	4 (0 ~ 20)
Societal Knowledge Justification	8.71 (7.99)	7 (0 ~ 49)	47.13 (30.79)	39 (14–150)
Week 2	1.95 (2.43)	1 (0 ~ 14)	10.71 (8.04)	10 (1 ~ 35)
Week 4	4.31 (4.57)	3 (0 ~ 22)	23.31 (16.17)	22 (6 ~ 63)
Week 6	2.44 (3.42)	1 (0 ~ 22)	12.97 (12.46)	9 (0 ~ 56)
Personal-relational Knowledge Justification	8.39 (6.29)	7 (0 ~ 25)	45.82 (22.36)	45 (13–85)
Week 2	2.97 (3.07)	2 (0 ~ 15)	16.57 (10.89)	14 (2 ~ 45)
Week 4	2.71 (2.75)	2 (0 ~ 13)	14.45 (9.28)	12 (2 ~ 45)
Week 6	2.72 (2.99)	2 (0 ~ 14)	14.81 (11.14)	14 (1 ~ 51)
Diversity in Perspectives	0.50 (0.15)	0.54 (0–0.67)	0.57 (0.05)	0.57 (0.48–0.67)

Total knowledge justification represents the number of knowledge justification based on the three perspectives generated by individual students across three discussions. Diversity in Perspectives reflects the level at which a group justified knowledge in diverse perspectives, with value closer to 1 representing more diversified justification.

Table 4. Descriptive statistics of social perspective taking scores in pre- and post-tests.

	Mean (SD)	Skewness	Kurtosis	Range (Min—Max)
Pre-test SPT	0.71 (1.40)	0.052	−0.080	6 (−2 ~ 4)
Post-test SPT	2.07 (1.81)	−0.141	−0.473	9 (−3 ~ 6)

Table 5. Correlations among students' knowledge justification and diversity in perspectives.

	1	2	3	4
Total Knowledge Justification (Individual)	-	.45 ***	.31***	−.07
Total Knowledge Justification (Peers)		-	.16	.03
Diversity in Perspectives (Individual)			-	.35***
Diversity in Perspectives (Group)				-

(*** $p < .001$, ** $p < .01$, * $p < .05$).

Table 6. Patterns of knowledge justification based on three social-moral perspectives.

Knowledge Justification within	Moral	Societal	Personal-relational	*N* (%)
All perspectives	O	O	O	98 (75.97%)
Non-moral perspectives	X	O	O	22 (17.05%)
Non-societal perspectives	O	X	O	4 (3.1%)
Non-personal-relational perspectives	O	O	X	1 (0.78%)
Personal-relational perspective only	X	X	O	4 (3.1%)
Total				129 (100%)

Knowledge justification and diversity in perspectives

To address Research Question 1, Poisson regressions with Generalized Estimation Equation (GEE) were used to examine whether the frequency of knowledge justification generated by individual students during CSR discussions predicted their weighted SPT score in the essay task, while controlling for gender, family resources, race, academic achievement, and pre-test weighted SPT score. GEE accounted for the interdependence of students within groups (students were nested in group discussions). The result (Model 1 in Table 7) shows that the total number of knowledge justifications significantly predicted changes in weighted SPT scores (B = 0.013, LLCI:0.005, ULCI:0.022, $p < 0.01$).

To address Research Question 2, we ran Poisson regressions with the individual and group diversity indices as the key predictors of SPT performance, controlling for the same covariates. To further examine if the frequency of knowledge justification and diversity in perspectives uniquely predicted changes in SPT, we ran an additional model that included all these variables. The result (Table 7) shows that neither individual nor group diversity index predicted changes in weighted SPT scores in the essays, after controlling for the covariates (Model 2). However, when the frequency of knowledge justification was included in the model 3, the influence of the group diversity index became positive (B = 2.313, LLCI: 0.200, ULCI: 4.426, $p < .05$). Neither gender nor academic achievement predicted changes in weighted SPT scores. Family resources positively predicted weighted SPT at post-test (B = 0.118, LLCI: 0.042, ULCI: 0.194,

Table 7. Generalized linear models predicting weighted social perspective taking by the frequency of knowledge justification and diversity in perspectives .

	Outcome: Weighted Social Perspective Taking								
	Model 1 Covariates + Knowledge Justification			Model 2 Covariates + Diversity			Model 3 Covariates + Knowledge Justification+ Diversity		
	Est.	LLCI	ULCI	Est.	LLCI	ULCI	Est.	LLCI	ULCI
Covariates									
Gender	−0.030	−0.316	0.257	−0.061	−0.368	0.247	−0.095	−0.388	0.199
Family Resources	0.120***	0.051	0.187	0.097*	0.013	0.181	0.118**	0.042	0.194
Race	0.245	−0.069	0.002	0.373*	0.049	0.697	0.302	−0.001	0.605
Achievement	0.001	−0.002	0.005	0.003	−0.000	0.007	0.002	−0.001	0.005
Pre-test SPT	0.010	−0.019	0.039	0.015	−0.015	0.045	0.013	−0.017	0.043
Key Variables									
Knowledge Justification	0.013**	0.005	0.022				0.015**	0.006	0.025
Diversity (Group)				1.821	−0.213	3.855	2.313*	0.200	4.426
Diversity (Individual)				−0.072	−1.210	1.067	−0.605	−1.210	1.067

Gender (1 = Female), Race (1 = White), Achievement = Academic Achievement Score, Knowledge Justification = the number of speaking turns that involved knowledge justification based on three social-moral perspectives: Moral, Societal, Personal-relational.

Diversity (Group/Individual) = Diversity in perspectives; the levels at which students' knowledge justification spread over diverse perspectives at the group/individual level (*** $p < .001$, ** $p < .01$, * $p < .05$)

$p < .05$), when controlling for pre-test scores. The effect of race was significant when the model 2 included diversity in perspectives and covariates only (B = 0.373, LLCI: 0.049, ULCI: 0.697, $p < .05$), but it became nonsignificant after the frequency of knowledge justification was considered.

Perspectives of social knowledge and SPT

To address Research Question 3, effects of the three perspectives of knowledge justification on individuals' weighted SPT were tested in separate models after controlling for covariates and diversity in perspectives (group/individual). As shown in Table 8, justification from the societal perspective (B = 0.026, LLCI: 0.014, ULCI: 0.039, $p < .001$) and personal-relational perspective (B = 0.026, LLCI: 0.002, ULCI: 0.050, $p < .05$) but not moral perspective significantly predicted changes in students' weighted SPT.

Discussion

The current findings contribute to a fine-grained theoretical and empirical understanding of the learning processes underlying collaborative argumentation and how the processes contribute to the development of social perspective taking (SPT). Specifically, the findings highlight the importance of knowledge justification and diversity in the perspectives to which students were exposed during group discussions in improving students' SPT over the six-week CSR intervention. These mechanisms are different from those found in many extant studies of social knowledge and reasoning in which children's reasoning or knowledge justification was examined individually via self-report or individual interviews (e.g., Krogh, 1985; McLeod-Sordjan, 2014). The present study helps to expand the current literature of social knowledge and reasoning by highlighting the

Table 8. Generalized linear models of students' weighted social perspective taking predicted by different social-moral perspectives.

	Outcome: Weighted Social Perspective Taking								
	Model 1 Moral Knowledge			Model 2 Societal Knowledge			Model 3 Personal-relational Knowledge		
	Est.	LLCI	ULCI	Est.	LLCI	ULCI	Est.	LLCI	ULCI
Covariates									
Gender	−0.058	−0.358	0. 242	−0.093	−0.380	0.194	−0.067	−0.361	0.226
Family Resources	0.098*	0.014	0.182	0.129***	0.056	0.202	0.104**	0.026	0.182
Race	0.400*	0.073	0.725	0.326*	0.042	0.609	0.330*	0.013	0.647
Achievement	0.004*	0.000	0.008	0.002	−0.001	0.006	0.002	−0.001	0.006
Pre-test SPT	0.016	−0.014	0.046	0.019	−0.011	0.048	0.009	−0.022	0.041
Key Variables									
Diversity (Group)	1.910†	−0.101	3. 918	2.233*	0.371	4.100	2.310*	0.100	4.524
Diversity (Individual)	0.089	−1.096	1.274	−0.362	−1.667	0.943	−0.452	−1.848	0.944
KJ (Moral)	−0.021	−0.077	0.035						
KJ (Societal)				0.026***	0.014	0.039			
KJ (Personal-relational)							0.026*	0.002	0.050

Gender (1 = Female), Race (1 = White), Achievement = Academic Achievement Score, KJ (Perspective) = Knowledge Justification; the number of speaking turns that involved knowledge Justification associated with each perspective of social knowledge: Moral, Societal, Personal-relational. Diversity (Group/Individual) = Diversity in perspectives; the levels at which students' KJ spread over diverse perspectives at the group/individual level. (*** $p < .001$, ** $p < .01$, * $p < .05$, $^{\dagger}p < .10$) .

process of internalization and appropriation, as well as peers' input on coordinating across multiple perspectives.

As was hypothesized, the frequency of knowledge justification that students generated during collaborative argumentation was associated with the improved SPT. This finding resonates with the theoretical assumption that justifying claims, standpoints, or positions toward a complex issue can push students to reflect on what they and others know or do not know (e.g., Scott et al., 2010; Tenenbaum et al., 2020). When individuals thoughtfully scrutinize ideas with evidence and reasons based on others' inputs rather than simply accepting, rejecting, or ignoring them, they are more likely to build and exercise intersubjectivity during collaborative argumentation. The frequency of knowledge justification may not only indicate the amount of effort that students put into their own sense making process but also the effort toward the process of intersubjectivity as a group throughout the discussion.

Another unique contribution of the current study pertains to the role of diversity in perspectives at the group level. Given that group diversity in perspectives was operationalized and calculated to represent the valid social inputs provided by group mates, excluding one's own performance during CSR, we assumed that a group of students generating knowledge justification with higher diversity in perspectives implied a greater likelihood for the group to coordinate knowledge across different abstract levels than groups that generated less diversity in perspectives. The positive effect of the group diversity index therefore suggests that participating in collaborative argumentation with group members who use higher levels of coordination contributes to greater learning of SPT. This finding was consistent for societal and personal-relational perspectives as well as the total amount of justified knowledge across all the three perspectives combined. As Vygotsky suggested, students' ways of thinking are firstly and largely influenced by the social contexts of learning before tools and strategies are internalized. In line with this, we interpret that productive dialogue generated by group members with frequent coordination across different perspectives and levels of abstraction, by itself, prompts students to think and reason about topics from more diverse angles, eventually leading to improved SPT.

Our findings showed that students' individual diversity index was not related to changes in SPT. One possible explanation might be that the presence of varying perspectives towards social knowledge, when initially emerging on the social plane (as captured by the group diversity index), takes time to be internalized. Individuals' diversity in perspectives during the discussion could have reflected students' mimicry of other group members' perspectives or an initial process of internalization. This intrapersonal process may play a less important role during the discussion compared to the complex, collective knowledge justification process that simultaneously occurs on the social plane.

The significant effect of societal and personal-relational perspectives further suggest the appropriate levels of attention to and consideration of story characters' emotions and personal concerns (i.e., personal-relational perspective) and expectations imposed as social roles (i.e., societal perspective) can be essential to SPT development. This lends support to moral development theorists who argue for the importance of displaying empathy and paying attention to affective, relational needs in moral decision-making (Carlo et al., 2010; Eisenberg, 1986; Noddings, 2005). However, it was surprising that the

moral perspective was not predictive of SPT improvement. This might be because when students were asked to reason about complex and ambiguous issues, moral perspectives often led to deontological reasoning that made it hard for students to productively argue about possible solutions to problems. Additionally, according to Kohlberg's stage theory on moral development, it is plausible that students in this age of 9 ~ 10 years old might still be imitating others' moral perspectives without internalizing them deeply, which resulted in the weak association between moral perspectives and improved SPT.

As mentioned above, students' justification from societal perspectives and personal-relational perspectives was significantly related to changes in SPT. The social norms embedded in CSR discussions (see more descriptions in Lin et al., 2022) appear to be inextricably linked to several aspects of Stage 3 of Kohlberg's theory: relationships or mutuality, role-taking, and normative expectations (Gibbs et al., 2013). As Stage 3 in moral development mainly corresponds to the societal perspective, positive social norms highlighted during CSR instruction may have sparked students' reasoning about social relationships/systems and group norms, which map out with societal knowledge within the ladder of abstraction.

The early adolescent population used in our investigations is somewhat unique for studies centering on SPT and moral/purposeful thinking in general. Many experiments/inquiries into SPT focus on early childhood (e.g., Carlson & Moses, 2001); there is also clear and apparent delineation of social thinking in later adolescence and/or adulthood (e.g., Galinsky et al., 2008). We consider the population used in this study to be an important, understudied group. The children are on the cusp of adulthood, offering the opportunity to explore possible mechanisms into the movement of their thinking into a more adult realm of social relationships. It is an age group that offers us a window into the how and why they adopt more complex thinking about social problems, and possibly into (at least the reasons behind) the trajectories their social thinking might take. Findings on this population would allow us to better design educational interventions leading to a more empathic, productive society.

Study limitation and future research direction

This study has several limitations. First, the central theme of the stories used in the CSR discussions surrounded the issue of social exclusion. Such design was intentional, with an aim to encourage students to make intertextual comparisons. The limitation, however, is that we do not know for sure whether the theme might have prompted students to focus more on societal and personal-relational knowledge justification over moral justification. Future research may consider replicating study findings using other multi-faceted topics that would be less biased toward one perspective of knowledge over the others that are different in terms of abstraction. Second, the development of SPT was measured across six weeks. A follow-up study might be worthwhile to examine whether the six-week CSR intervention would yield a long-term sustaining effect on the development of SPT. Third, the current study exclusively focused on the knowledge justification of individual students and their peers, while teachers who played a facilitator's role in CSR discussions might have also contributed to students' SPT. Future research can further examine teacher's facilitation of collaborative argumentation and how that affects students' SPT.

Conclusions

This study provides empirical evidence showing the processes by which elementary students' collaborative argumentation about socially and morally complex issues fosters the learning of SPT. As moral development researchers suggest that students' SPT progresses from an egocentric view toward a multiple-perspective stance as they age (Gurucharri & Selman, 1982) and such process can be promoted by social interactions (Blatt & Kohlberg, 1975), our findings suggest that collaborative argumentation can catalyze this transition by engaging students in dialogue where they are encouraged to justify their social understanding across multiple perspectives with different levels of abstraction (moral, societal, and personal-relational). Overall, our findings provide steppingstones that bridge our understanding between collaborative argumentation and social perspective taking in an organic, naturalistic, and collaborative learning environment, revealing how relatively concrete, contextualized, and personal ways of thinking can be associated with SPT improvement.

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