Cooperative learning during math lessons in multi-ethnic elementary schools: counting on each other

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CHAPTER 5

The impact of a cooperative learning curriculum on pupils' social status development and interethnic bias at multi-ethnic elementary schools

Abstract

In this study we investigated popularity and perceived non-cooperativeness in multi-ethnic elementary schools. Subjects were a subsample of study 1. 94 Pupils (26 teams) from five multi-ethnic elementary schools participated in a structured cooperative learning (SCL) curriculum of 11 lessons. Both the teachers and pupils had no prior knowledge of CL skills. The results show that SCL time increased popularity and decreased perceived non-cooperativeness across ethnic background. In addition, prior knowledge of CL skills enhanced the popularity of immigrant pupils and decreased differences in perceived non-cooperativeness between immigrant and national pupils. Importantly, SCL time only raised popularity and decreased perceived non-cooperativeness within ethnically heterogeneous teams. This last result extends the notion that enduring interethnic contact is fruitful for interethnic friendships.

Key words: cooperative learning experience; popularity; perceived non-cooperativeness; interethnic bias; multi-ethnic elementary schools

Impact of a cooperative learning curriculum on social status development and interethnic bias

1. Introduction

Research revealed that the segregation of groups decreases the intergroup relations (Sherif, White & Harvey, 1955). Bettencourt, Dorr, Charlton and Hume (2001) and Dembo and McAuliffe (1987) showed that mere *perception* of distinguishable groups suffices to increase both *intra*group cooperation and *inter*group competition. Various studies have demonstrated that ethnicity is one of the most powerful facilitators of the perception of distinguishable groups (Garza & Santos, 1991; Kirchmeyer, 1993; Nessdale, Maass, Griffiths & Durkin, 2003) and is related to social status differences (e.g., Warring, Johnson, Maruyama & Johnson, 1985). In this study we use the term interethnic bias to refer to situations in which individuals favor people with the same ethnicity over people with a different ethnicity.

Most of the studies into interethnic bias have been carried out in an experimental setting with adult subjects. Phinney, Ferguson, and Tate (1997) argued that - although experimental research has provided important insights - the real challenge lies in the reduction of interethnic bias in the educational setting. In a similar vein, Dixon, Durrheim, and Tredoux (2005) stated that there is a gap between interethnic bias as measured in the experimental setting and how interethnic bias is measured in the field (e.g. in an educational setting). We agree that interethnic bias in an educational setting demands more scientific attention. In the Netherlands, interethnic bias occurs on a daily basis in a great number of multi-ethnic schools, most of which are located in the densely populated Western part of the country (Gijsberts, 2004). One of the major challenges these schools face is how to promote friendship and cooperation among students with different ethnic backgrounds. Gijsberts (2004) emphasized that the incline in the last decades in the number of immigrants has been accompanied by increased segregation, especially in the large cities. Increased segregation in urban areas is a widespread phenomenon that takes place in many countries, like the USA (see for a recent study, Shelton & Richeson, 2005) and Great Britain (Dixon et al., 2005). This phenomenon calls for research into interethnic bias in the multi-ethnic setting. A number of researchers have claimed that interethnic exposure time is an effective means to decrease interethnic bias (e.g., Eller & Abrams, 2004; McGlothlin & Killen, 2005). One aim of this study is to extend these claims. Our study differs from the studies of Eller and Abrams and McGlothlin and Killen on two grounds. Firstly, the two earlier mentioned studies investigated interethnic bias by assessing friendships, we studied interethnic bias by measuring interethnic popularity and perceived interethnic non-cooperativeness. Secondly, we investigated interethnic bias in a structured cooperative learning (SCL) setting rather than in a direct teaching setting. A SCL setting is defined here as an educational method in which pupils are placed in small groups (typically tetrads), and work on assignments that invite them to work together, and

have been trained how to give and receive verbal help, following Webb and her colleagues (Webb & Farivar, 1994; Webb, Troper & Fall, 1995).

In addition to interethnic bias, we studied how an SCL experience is related to a change in the intragroup social status (as measured with popularity and perceived non-cooperativeness). Several studies have found positive relations between time spent in a SCL setting and intragroup cooperation (Gillies & Ashman, 1997; Johnson & Johnson, 1994) and popularity (Wright, Giammarino & Parad, 1986).

In the remainder of this introduction we present the contact hypothesis as our theoretical framework, explore to what extent this hypothesis is supported by earlier studies in naturalistic educational settings, and explain how we investigated it in this study.

1.1. Theoretical background: The intergroup contact hypothesis

Allport (1954) proposed the intergroup contact hypothesis to explain interethnic bias. The contact hypothesis states that grouping people with different ethnic backgrounds is not enough to oppose bias. Interethnic bias will only be countered when four criteria are met. These are: cooperation instead of competition, equal status, common goals, and support of authorities and institutions (Allport, 1954; Van Dick et al., 2004). A meta-analysis carried out by Pettigrew and Tropp (2006) provided support for the importance of the four criteria as specified by Allport. However, Pettigrew and Tropp also demonstrated that the four earlier mentioned criteria are not essential for a reduction in interethnic bias. Rather, their presence facilitates positive interethnic relations. Pettigrew and Tropp asserted that it is not the presence of the four conditions, but the exposure time to ethnically distinct groups that is essential for a decrease in bias. That is, the more people from different ethnic groups get to know each other, the more they are inclined to like each other. As such, the contact hypothesis is interpreted as a longitudinal model, in which a fifth criterion, the opportunity to let people become friends, is the core feature (see also Pettigrew, 1998). Other studies have found support for this notion (e.g., Eller & Abrams, 2004).

1.2. Operationalizing interethnic bias

In the preceding section we mentioned that most studies investigated interethnic bias by asking pupils whether or not they think they can become friends with someone from a different ethnic background (e.g. McGlothlin & Killen, 2005). Few studies have investigated interethnic bias in a multicultural SCL context (e.g. Slavin & Cooper, 1999), Warring et al. (1985) did show that SCL intensified the number of interethnic activities of pupils (school-related activities or activities at home). Johnson, Johnson, and Tiffany (1984) demonstrated that SCL strengthened

interethnic acceptation and support. Little is known about the influence of SCL experiences on the perceived within teams interethnic non-cooperativeness and popularity. This is remarkable since the perception of having cooperative and popular team peers is likely to affect group productivity (Gillies & Ashman, 1997; Johnson & Johnson, 1994).

1.2.1. Popularity

Popularity is usually measured by asking pupils to nominate those pupils in the classroom whom they like most and least. The popularity status of a given student is then calculated by subtracting the standardized unpopular scores from the standardized popular scores. This nomination method has some drawbacks. Firstly, some researchers maintain that the use of nominations gives a distorted impression of pupils' popularity status, since pupils most often only think about who they like most (for a discussion see Maassen & Verschueren, 2005). Secondly, there is evidence to suggest that what researchers define as popularity is not the same as what pupils understand it to be: that is, the traditional operationalization of popularity is argued to lack ecological validity (see Košir & Pečjak, 2005 and Babad, 2001 for a more detailed discussion). Babad argued that the 'classic' method to infer popularity from pupils' ratings about which peers they like the most is an indirect measure, since only the pupils' personal liking and disliking of classroom peers is measured. He proposes a more direct and valid measure of popularity status, which Babad coined judgmental sociometry. Judgmental sociometry refers to the procedure in which pupils are asked to nominate those classroom peers whom they perceive to be the most representative of a social construct. Babad's study suggested that assessing the degree to which pupils are seen as well liked by everyone is a more valid operationalization of popularity.

An American study by Coie, Dodge, and Copotelli (1982) suggested that immigrant students in general are less popular than white pupils since they form a minority group (see also Kistner, Metzler, Gatlin & Risi, 1993). We argue that with prolonged exposure to SCL the popularity of immigrant pupils increases as compared to that of national pupils.

1.2.2. Perceived non-cooperativeness

This is another way to assess interethnic bias. Pupils are asked to nominate team members whom they perceive to be non-cooperative during SCL. Research has shown that SCL time is positively related to a rise in pupils' cooperativeness (Gillies & Ashman, 1997; Johnson & Johnson, 1994). An American study by Hallinan and Teixeira (1987) demonstrated that black pupils were more positive towards other pupils in their team than were white pupils. Other studies have revealed that a SCL experience can boost the popularity of immigrant pupils and decrease the difference between national and immigrant pupils regarding their interethnic cooperativeness (e.g., Slavin & Cooper, 1999).

2. Hypotheses

On the basis of the preceding section, we test three hypotheses in this paper. Firstly, we attempt to corroborate the findings of other researchers (e.g., Gillies & Ashman, 1997, and Wright, Giammarino & Parad, 1986) that SCL time is positively related to pupils' perceived popularity and negatively related to pupils' perceived non-cooperativeness. Secondly, based on Slavin and Cooper's (1999) study we hypothesize that a SCL experience augments the popularity of immigrant pupils and decreases the difference in perceived non-cooperativeness between national and immigrant pupils. Thirdly, we hypothesize that a SCL experience heightens the popularity within ethnically heterogeneous teams and lowers the perceived non-cooperativeness. In order to do so we contrast ethnically heterogeneous teams and ethnically homogeneous teams. A difference between these two types of teams clarifies whether or not the salience of ethnicity diminishes as a function of SCL time. We hypothesize that popularity increases as a function of SCL time whereas perceived non-cooperativeness decreases as a function of SCL time. This holds in the ethnically heterogeneous teams only.

3. Method

3.1. Sample

A SCL curriculum of 11 lessons was carried out in the 5th grade of five multi-ethnic elementary classrooms (i.e. classes with more than 25% immigrant pupils). The first two lessons of this curriculum covered a SCL training in which pupils were instructed in the use of basic SCL rules and helping behavior. During lesson three to 11 pupils worked in teams on math group assignments. 26 Teams participated in this study, consisting of three to four pupils each, amassing 94 pupils (10-12 years old; 43 national, 51 immigrant pupils; 51 boys and 43 girls). See Table 1 for an overview. This sample reported here draws from the same sample as Chapter 2, 3 and 4 -see also paragraph 5 of Chapter 1 of this thesis, entitled: *Overview of the thesis and hypotheses*. The teams consisted of pupils with comparable mathematical and linguistic skills (determined on the basis of class grades) and with roughly the same age. 18 Teams were heterogeneous in ethnicity and eight teams were homogeneous in ethnicity (either all national pupils, or either all immigrant pupils). The composition of the teams remained fixed throughout the SCL curriculum. All teachers indicated implementing a direct teaching method. Additionally, both the teachers and their pupils reported to have no prior knowledge of CL skills.

Table 1

Sample characteristics and scores on the social status questionnaire

Ethnicity	Number of teams[1]	Gender	Popularity at T1 (*SD*)	Popularity at T2 (*SD*)	Perceived non-cooperativeness at T1 (*SD*)	Perceived non-cooperativeness at T2 (*SD*)
National: 43		Boys: 25 Girls: 18	20.48 (12.51)	23.65 (11.80)	.49 (.60)	.19 (.28)
Immigrant: 51		Boys: 26 Girls: 25	18.56 (11.54)	19.75 (11.74)	.19 (.31)	.10 (.19)
Total	**26**					

3.2. Instrumentation

3.2.1. Popularity

The popularity scale was filled in twice by all pupils: at the start of the SCL curriculum (T1) and at the end (T2). Pupils were required to rate their team members as perceived by the whole class on the behavioral characteristic: ‘‘is well liked by everyone’’. Scores were averaged per pupil, excluding their own scores.

Assessment of the psychometric properties of instruments that aim to measure popularity is notoriously difficult (for a discussion see Terry, 2000). A great many studies use multiple measurements of popularity, as is the case in the present study. A compelling question regarding multiple measurements is whether the test-retest stability is satisfactory. That is, whether students’ scores at the second measurement of popularity can be accurately predicted on the basis of the scores obtained at the first measurement. An extensive literature review by Cilessen, Bukowski, and Haselager (2000) found that popularity categories showed satisfactory short-term stability. In addition, Jiang and Cilessen (2005) demonstrated in a meta-analysis that continuous popularity inventories (like popularity) also have good test-retest reliability and are more stabile than categorical types of popularity classification.

3.2.2. Perceived non-cooperativeness

From lesson four onwards pupils filled in a checklist at the end of every lesson about how well they implemented basic SCL rules and rules on giving and receiving help that they were taught in a SCL training that preceded the SCL math curriculum (see also *Procedure*). All pupils completed eight checklists. The pupils were required on this checklist to nominate team members

who did not implement the SCL rules by writing down the name(s) of these team members. For every lesson we recorded the number of times that a pupil was nominated as non-cooperative by his or her team peers.

3.3. Procedure

The SCL curriculum consisted of 11 lessons, one hour each. The five participating teachers were first instructed by the first author in a mini workshop of two hours how to teach in a SCL setting. Then the teachers taught the pupils rules for effective SCL in a training of two lessons. In lesson 1 basic rules of SCL were introduced to the pupils (‘‘everyone cooperates’’, ‘‘everyone listens to each other’’, “everyone shares their knowledge and opinions’’, and ‘‘check whether everyone agrees’’). These rules were practiced in an exercise, requiring pupils to build a bridge between their tables that could bear a small weight. In lesson 2, pupils were taught rules about giving and receiving help, which were adapted from studies carried out by Webb and her colleagues (Webb & Farivar, 1994; Webb et al., 1995). These rules included for example ‘‘ask precise questions’’ and ‘‘give help when needed’’. Subsequently, pupils practiced the SCL rules in a cooperative math assignment. During lesson three to 11, pupils completed similar cooperative math assignments in fixed teams, under supervision of the teacher. In each lesson two authentic math assignments with a common theme (e.g., the zoo) had to be solved by the pupils. Authentic math assignments are mathematical tasks with a strong narrative structure that are embedded in contexts familiar to the children and to which multiple solutions are possible. We used these assignments because research has demonstrated that assignments with multiple solutions stimulate pupils’ motivation to cooperate (e.g., Chizhik, 2001; Cohen, 1994). Pupils were assured that their job consisted of understanding rather than completing the assignments.

3.4. Analytical perspective

The hypothesis that SCL time is positively related to pupils’ popularity and negatively related to pupils’ perceived non-cooperativeness is analyzed individually. Nevertheless, since individual scores are not truly independent from each other in a SCL setting, an explorative analysis of the relationship of SCL time with popularity and perceived non-cooperativeness at the group level is also incorporated. We performed analyses at the group level in an attempt to corroborate the findings we found at the individual level. Due to the small sample size, the relationship of helping behavior with math post-test scores can not be evaluated with a multilevel approach. Inspired by earlier studies using a similar approach (Gillies & Ashman, 2000; Webb &

Farivar, 1994), we conducted analyses at the group level by aggregating individual scores for each team. Because of the small sample size, nonparametric tests were carried out.

The hypothesis that SCL time only affects popularity and perceived non-cooperativeness within ethnically heterogeneous teams is analyzed at the group level. Due to the fact that the data are non-parametric and the number of teams in the present study is too small to accommodate a repeated measures design, we analyzed the effect of SCL time on popularity for homogeneous and heterogeneous teams separately, using non-parametric tests.

4. Results

4.1. Preliminary analyses

A Pearson's correlation test revealed that there was no statistically reliable correlation between the averaged perceived non-cooperativeness and popularity.

4.2. Main results

4.2.1. Hypothesis 1

With respect to popularity, we found that pupils generally rated their fellow team members as more popular at the end of the SCL curriculum, Wilks' $F(1,93) = 5.37$, $p < .03$, $\eta^2 = .06$. Regarding perceived non-cooperativeness, we found that the frequency with which pupils nominated fellow team members as non-cooperative decreased as a function of SCL time, Wilks' $F(7,87) = 5.63$, $p < .001$, $\eta^2 = .31$.

Analysis at the group level. Regarding popularity, we found that SCL time positively influenced the popularity scores of teams, $Z(26) = -2.07$, $p < .04$. Thus, team members gave higher scores to each other at the end of the SCL curriculum as compared to the start of the SCL curriculum. With respect to the Perceived non-cooperativeness, we combined the nominations on the checklists to create three new group-level variables: T1 (averaged nomination on the first three measurements), T2 (averaged nomination on the fourth to sixth measurement) and T3 (averaged nomination for the last three measurements). A Friedman test showed that the non-cooperativeness nominations decreased as a function of time, $\chi^2(26) = 10.64$, $df = 2$, $p < .006$.

4.2.2. Hypothesis 2

With respect to popularity, a paired samples test revealed an effect for national pupils, Wilks' $F(1,50) = 4.86$, $p < .04$, $\eta^2 = .09$. National pupils were liked more at the end of the SCL curriculum than at the beginning. No such effect occurred for immigrant pupils.

Regarding the perceived non-cooperativeness, a repeated measures test was performed with ethnicity as independent variable and nominations from the perceived non-cooperativeness checklist as dependent variable (T1 to T8). The analysis revealed a significant effect, Wilks' $F(7,84) = 2.50$, $p < .03$, $\eta^2 = .17$. The difference between national and immigrant pupils in perceived non-cooperativeness decreased as a function of SCL time. The difference between national and immigrant pupils was significant at the start of the SCL curriculum, $t(92) = 2.97$, $p < .005$, with national pupils receiving more non-cooperativeness nominations than immigrant pupils. At the end of the curriculum, the difference between the perceived non-cooperativeness nominations of national pupils and immigrant pupils was no longer significant, $t(92) = 1.75$, $p > .08$. National and immigrant pupils both became more cooperative in the perception of their fellow team members, but the perceived non-cooperativeness of national pupils decreased more quickly than that of immigrant pupils.

4.2.3. Hypothesis 3

Ethnicity of each team was recoded into (1) homogeneous (all pupils national or all pupils immigrant), and (2) heterogeneous (one or more immigrant pupils combined with national pupils).

Regarding popularity, we found a trend in favor of our hypothesis that the popularity within ethnically heterogeneous teams is higher at the end of the SCL curriculum as compared to the start of the CL curriculum, $Z(18) = -1.86$, $p < .07$. No effect of SCL time on the popularity within ethnically homogeneous teams was found, $Z(8) = -.56$, $p > .57$.

With respect to perceived non-cooperativeness, a Friedman test revealed that the ethnically heterogeneous teams perceived less non-cooperativeness in their team at the end of the SCL curriculum than at the beginning, $\chi^2(18) = 11.29$, $df = 2$, $p < .005$. For ethnically homogeneous teams the perceived non-cooperativeness did not change as a function of SCL time, $\chi^2(8) = .96$, $df = 2$, $p > .61$.

4.3. Summary of findings

In this study we investigated the development of interethnic bias among pupils from multi-ethnic elementary schools during a SCL curriculum. We hypothesized that the time team members spent working in their team is positively related to their popularity and negatively related to their perceived non-cooperativeness. We further hypothesized that SCL time increases popularity and levels off the difference in perceived non-cooperativeness between national and immigrant pupils. Lastly, we expected that SCL time increases the popularity and lowered the perceived non-cooperativeness within ethnically heterogeneous teams, but not within ethnically

homogeneous teams. The results show that SCL time augmented the popularity scores and decreased non-cooperativeness nominations both at the individual and the group level. At the individual level we found that the SCL curriculum augmented the popularity of immigrant pupils and decreased the difference in perceived non-cooperativeness between national and immigrant pupils. The perceived non-cooperativeness of national pupils showed a steeper decrease than that of immigrant pupils. Lastly, SCL time lowered the perceived non-cooperativeness within ethnically heterogeneous teams and tended to increase the popularity.

5. Discussion

The finding that pupils rated their fellow team members as more popular and cooperative with increasing SCL time is in accordance with earlier findings (Gillies & Ashman, 1997; Johnson & Johnson, 1994; Wright et al., 1986). These findings highlight the positive impact of SCL on pupils' social status. There is a whole strand of research that suggests that SCL is a more effective teaching method than direct teaching, not only regarding social skills, but also with respect to academic performance (for overviews see Qin, Johnson & Johnson, 1995; Rohrbeck, Ginsburg-Block, Fantuzzo & Miller, 2003).

Implementing SCL on a regular basis was a new experience for both the teachers and the pupils who participated in this study. Nevertheless, this study shows that SCL can decrease interethnic bias in multi-ethnic teams even with minimal prior knowledge of CL skills. The results demonstrate that there was a steady decline in team members' perception of the non-cooperativeness of pupils with a different ethnicity with increasing SCL time. Even more positive effects of SCL on interethnic relations are to be expected with more experience in, and knowledge of, SCL.

We found that national pupils were perceived to be more popular at the end of the SCL curriculum. Additionally, the perceived cooperativeness of national pupils increased more quickly than that of the immigrant pupils: they were rated as less cooperative at the start of the SCL curriculum. This finding relates to the suggestion of Oetzler (1998) that national pupils have more difficulty to work in teams, possibly because they have a more individualistic learning style. This is also in keeping with the findings of Hallinan and Teixeira (1987), who found that black pupils in the USA had a generally friendlier attitude towards other pupils in their team than had national pupils. Our study suggests that SCL experiences can counter the tendency of national pupils to work alone.

The results further showed that composing multi-ethnic teams is more effective for the reduction of interethnic bias than composing ethnically homogeneous teams: only in the multi-ethnic teams did the popularity increase and the perceived non-cooperativeness decrease with

more CL experiences. These results confirm the revised contact hypothesis, as proposed by Pettigrew (1998), that the development of interethnic friendship reduces interethnic bias. We showed that not only friendship intensifies with increasing exposure to an ethnically heterogeneous group, but also that the interethnic popularity and perceived interethnic cooperativeness are boosted with increased exposure time. This finding needs to be qualified with regard to the term 'ethnicity'. A study by Kistner et al. (1993) asserted that research into interethnic bias in multicultural classrooms should not only focus on the students' ethnic status in terms of majority or minority per se, but that it also necessitates a focus on the relative majority / minority ratio in a specific classroom. In this respect, Bellmore, Witkow, Graham, and Juvonen (2004) provided evidence that pupils' relative ethnic status is related to maladjustment: pupils who were a majority in their class but a minority in the society showed more maladaptive behavior than pupils who were a minority both in the classroom and the society. Since the number of multi-ethnic schools where the majority of the pupils has an immigrant background is on the rise (Gijsberts, 2004), this assertion is becoming increasingly more important in the educational setting.

5.1. Conclusion

Allport's contact hypothesis has been criticized as containing too many 'exceptions to the rule'. That is, research has revealed many qualifying conditions that have obscured the originally transparent hypothesis (Dixon et al., 2005; Eller & Abrams, 2004). Also, the contact hypothesis does not explain why and how cooperation, equal status, common goals, and support of authorities and institutions decrease bias; it only describes when it does so (Pettigrew, 1998). Our study suggests that Pettigrew's (1998) longitudinal interpretation of the contact hypothesis provides a better explanation for the interethnic bias in ethnically diverse classrooms. In addition, our findings show that SCL may provide a solution to interethnic problems at multi-ethnic elementary schools.

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