A collaborative learning approach to promote positive interdependence in a "Planning Sustainable Cities" course

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Abstract: Following the scholarship of teaching and learning, this study is contextualized in a "Planning Sustainable Cities" course. It presents a collaborative learning approach to promote positive interdependence. Under certain conditions, collaborative learning approaches can promote among students each other's efforts to learn, resulting in positive interdependence (cooperation). However, cooperation is not always facilitated, and it might be challenged when students have diverse backgrounds. This study incorporated elements of mixed-methods and design-based research approaches. Pre and post-intervention surveys were conducted with 23 international students as well as in-depth interviews and focus group discussions on the type and level of collaboration, and student's view of cooperative learning. Based on the results of the descriptive phase and the literature, we addressed two key issues during the design phase: improving group dynamics and facilitating collaboration in the Learning Management System (LMS). No outside enemy interdependence was observed (negative interdependence with another group). Means interdependence is the most predominant characteristic of positive interdependence present in group work and positively perceived by the students. In the collaborative learning approach that was designed, both a group dynamics workshop (analogue/in class) and group pages in the LMS seem to help in improving means interdependence.

Keywords: scholarship of teaching and learning, design-based research, collaborative learning, positive interdependence

Introduction

Following the Scholarship of Teaching and Learning (Bishop-Clark and Dietz-Uhler, 2012), this paper self-reflects and is grounded on the opening course of the MSc specialization on Urban Planning and Management (UPM) of the Faculty ITC of the University of Twente (the Netherlands). The UPM specialization consists of four interconnected courses of 7 ECTS credits each:

- UPM 1. Planning Sustainable Cities
- UPM 2. Building Inclusive and Competitive Cities
- UPM 3. The Compact City
- UPM 4. Risk-Sensitive Urban Planning Studio

Students of these courses are international and predominately from the Global South. This paper relies on the critical analysis of the "Planning Sustainable Cities" course where group work is one of the main teaching activities. Some of the advantages of group work are that students have the potential to maximize and share their skills with the rest of the group (Brewer and Klein, 2006; Haigh and Gold, 1993). However, during group work, cooperation is not always facilitated and motivated and it might be challenged when students have different cultural backgrounds, disciplines or skills (Hennebry and Fordyce, 2018).

I would argue that in a diverse and unequal world educating (future) planning practitioners requires them to practice empathic and collaborative forms of learning as opposed to competitive ones. Competitive values are clearly differentiated from those of *cooperative efforts*. Cooperative efforts values comprise "commitment to one's own and others' success and well-being, commitment to the common good, and the view that facilitating and promoting the success of others is a natural way of life" (Johnson and Johnson, 2009, p. 372). On the contrary, *competitive efforts* teaches the values of "getting more than others, beating and defeating others, seeing winning as important, and believing that opposing and obstructing the success of others is a natural way of life" (Johnson and Johnson, 2009, p. 372). In collaborative efforts group membership per se is not enough to produce higher achievement and cooperation, "knowing that one's performance affects the success of group mates seems to create responsibility forces that increase one's efforts to achieve" (Johnson and Johnson, 2009, p. 366).

Under certain conditions, collaborative learning approaches can promote and facilitate among students each other's efforts to learn, resulting in *positive interdependence* (cooperation) (Brewer and Klein, 2006), critical thinking (Cooper, 1995) and students satisfaction (So and Brush, 2008). A typical structure of collaborative learning is think-pair-share. This study concentrates only on positive interdependence as long-standing evidence shows that it is at the core of collaborative learning (Johnson, Johnson, and Smith, 2007, p. 23; Laal, 2013, p. 1436).

However, there are different views on how to stablish positive interdependence (Brewer and Klein, 2006) and new challenges emerge with the incorporation of digital tools (Jaldemark, Hrastinski, Olofsson, and Öberg, 2018). Therefore, the main goal of this research is to develop a (computer-supported) collaborative learning approach that promotes positive interdependence in a group assignment. This collaborative learning approach entails the use of digital tools such as a learning management system (LMS) as well as analogue methods (e.g. group dynamics coaching). The main research question of this research is:

How can certain computer-supported collaborative learning approach facilitate positive interdependence in a group assignment?

Effective cooperation and positive interdependence

Johnson and Johnson (2009) theorized that five variables mediate effective cooperation: positive interdependence, promotive interaction, individual accountability, social skills, and group processing. Furthermore, positive interdependence it is also considered as "the heart of cooperative efforts" (Johnson *et al.*, 2007, p. 23) and a pivotal aspect (Laal, 2013, p. 1436).

Positive interdependence exists when "there is a positive correlation among individuals' goal attainments; individuals perceive that they can attain their goals if and only if the other individuals with whom they are cooperatively linked attain their goals" (Johnson and Johnson, 2009, p. 366). Positive interdependence encourages students to work together in order "to maximize the learning of all members, sharing their resources, providing mutual support, and celebrating their joint success" (Johnson *et al.*, 2007, p. 23). Johnson and Johnson (2009) also consider that positive interdependence results in *promotive interaction* and they give the example of "individuals encouraging and facilitating each other's efforts to complete tasks in order to reach the group's goals" (Johnson and Johnson, 2009, p. 366).

Types of positive interdependence

The literature on cooperative learning describes three main types of positive interdependence: *outcomes, means* and *boundaries interdependence*. From a motivational perspective, the goals and rewards that are defined in the project group task will encourage and orient the students to cooperate and work towards a common desired outcome (*outcomes/end state interdependence*). For example, a group could get a joint reward (a bonus) when every member of the team obtains a specified score (Johnson et al., 2007). Slavin (1996, p. 44) indicates that "cooperative incentive structures create a situation in which the only way group members can attain their own personal goals is if the group is successful". The way that students perceive goals and rewards will influence what means they will choose to achieve the desired end state (Johnson & Johnson, 1992).

Means interdependence -and those proposing a social cohesion perspective- include the (complementary) *roles* that students are assigned within the group and the *tasks* assigned to individuals (tasks which are overlapping and interdependent on each other). Social cohesion theorists, "emphasize the idea that students help their groupmates learn because they care about the group" (Slavin, 1996, p. 46). Teambuilding, group self-evaluation and other cohesiveness-building activities can teach students value their groupmates, their roles will also make them dependent on one another and more likely "to encourage and help one another to succeed" (Slavin, 1996, p. 46). From a cognitive perspective the tasks and interactions that students perform will benefit cooperation and e.g. critical thinking for "reasons which have to do with mental processing of information" (Slavin, 1996, p. 49). Slavin (1996) explains the importance of group interactions and how students learn from each other since "in their discussions of the content, cognitive conflicts will arise, inadequate reasoning will be exposed, disequilibration will occur, and higher- quality understandings will emerge" (Slavin, 1996, p. 49). *Resources* interdependence is the third subcategory of means interdependency and requires that each member has part of the resources needed to complete the task (Johnson *et al.*, 2007, p. 23).

Boundaries among individuals and groups will also determine positive interdependence as they will determine who is interdependent with whom. Johnson *et al.* (2007, p. 23) state that *boundaries interdependence* may be determined by the way individuals are segregated into different groups based on "abrupt discontinuities" (e.g. students seat together, wear same shirts or share history). Three subcategories are recognized: *environmental* (related to the specific work area), *identity* (what binds students together), and *outside enemy* (negative interdependence with another group). This last sub-category, in my opinion and based on my teaching practice, may be problematic as it contradicts the values of cooperative learning by stablishing an "outside enemy". My assumption is that inter-group cooperation also generates intra-group cooperation and that groups do not compete against each other.

In this study, I focus on positive interdependence because its three categories: outcomes, means and boundaries interdependence are in direct relation to how a teacher designs the teaching and learning environment. In turn, positive interdependence results in *promotive interaction* and occurs when students encourage and facilitate each other's efforts to complete tasks and achieve the group's goals by (a) helping and assisting each other, (b) exchanging needed resources such as information and materials, (c) providing each other with feedback, (d) challenging each other's conclusions and reasoning, (e) advocating working harder to achieve the group's goals, (f) influencing each other, and (g) acting in trusting and trustworthy ways (Johnson *et al.*, 2007, p. 24).

Theoretical framework

Figure 1 summarizes the theoretical framework used in this study. It focuses on a collaborative learning approach aiming at effective cooperation as a result of distinct types of positive interdependence. Based on this theoretical framework, the main research goal for design research is to develop a (computer-supported) collaborative learning approach that promotes positive interdependence in a group assignment.

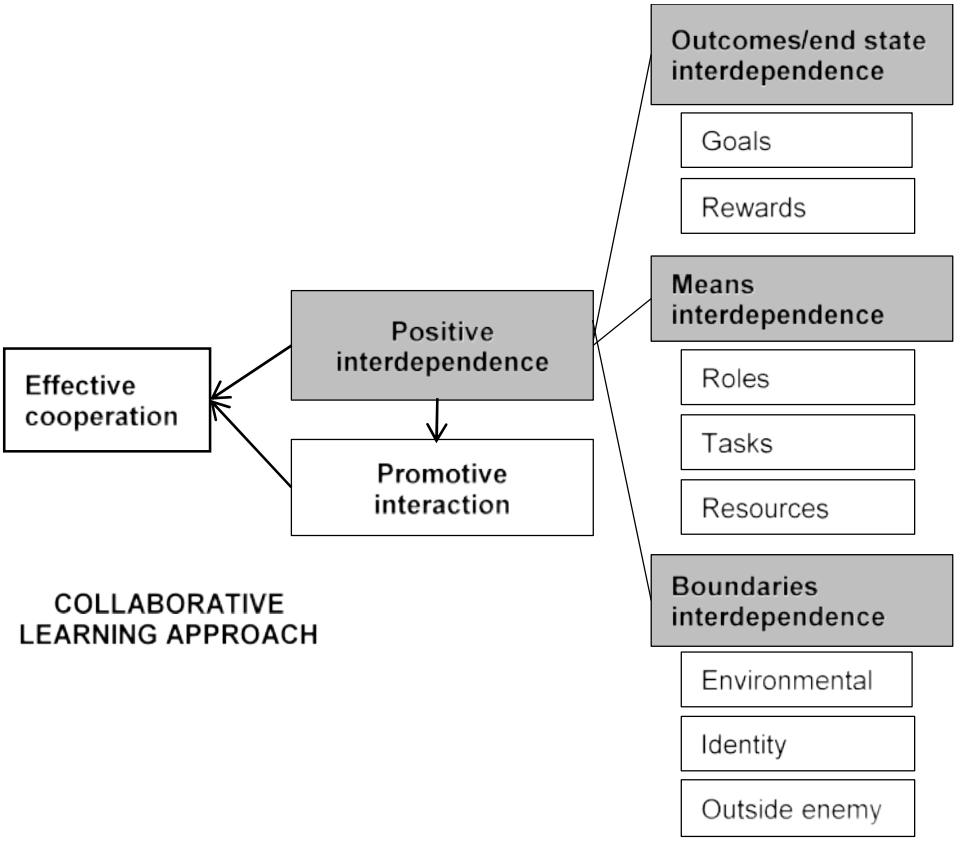

Figure 1 Theoretical framework. Positive interdependence types in collaborative learning.

Methods

This study incorporated elements of a mixed-methods (QUAL-quan) approach (Bryman, 2006; Tashakkori and Teddlie, 2010) and designed-based research approach. A better understanding of the needs, design and evaluation of a (computer-supported) collaborative learning approach required both the use of quantitative methods (e.g. cooperative learning questionnaire survey) as well as in-depth understanding of the type and level of collaboration, what students think about cooperative learning and why. The research participants were 18 students registered in the elective module "Analysis of intra-urban, socio-spatial patterns" (cohort 2017-2018) and 23 students of the UPM specialization course "Planning the Sustainable City" (cohort 2018-2020).

Data collection

Data was collected to 1- improve the understanding of student's perception of group work, current obstacles and forms of group interaction; 2- to design a computer-supported collaborative learning approach; and 3- to identify what dimensions of positive interdependence emerge through collaborative learning.

During the different phases of this study, data was collected on 1- Students perception of group work assignments, current obstacles in group cooperation, types of positive interdependence and extent of use of Learning Management System tools in those interactions (descriptive phase), 2- types of positive interdependence emerging from computer-supported collaborative approaches (design phase), and 3- recommendations emerging from discussion with colleagues and course evaluation (evaluation phase).

Data was collected between June and December 2018 through: one paper based self-administered survey (Cooperative learning questionnaire –(Fernandez-Rio, Cecchini, Mendez-Gimenez, Mendez-Alonso, and Prieto,

2017)), one in-depth interview with alumna, two focus groups discussions (FGDs) and observations in the use of the LMS CANVAS™. As course coordinator and teacher, I collected the data myself and asked the support of a colleague to conduct the FGDs. The first FGD was conducted as a practical within a research methods class after the students had learned about FGDs. The facilitator was one of the students and we provided her with the conceptual framework. This help reducing the research-participant gap and power bias. The final FGD was moderated by an education specialist and was part of the course evaluation.

The measurement level of the quantitative data from the survey is ordinal (liker scale). The rest of the data is qualitative (text).

Secondary data was compiled and they consisted of formal course evaluations (EVASYS™) and instructions of similar group assignment used in the last 3 years.

Ethical standards and concerns

Participants were informed about the project and gave their consent (in written for survey and verbally for FGD). The FGD was recorded after informed consent. To reduce power bias, I used triangulation (i.e. anonymous students' evaluation of previous years) and final evaluation discussion was conducted by education specialist. Storage and processing of data is done following ITC protocols.

Analysis

The analysis of the data was done in three phases.

1. Descriptive phase / needs analysis. It included the definition and construct of positive interdependence (Figure 1) and current collaborative learning. I analysed the in-depth interview with former graduate, FGDs and course evaluation by making use of ATLAS.ti™ (axial coding).

2. *Design phase*. It included the design intervention (evidence-based). I used an existing and validated "cooperative learning questionnaire" (Fernandez-Rio *et al.*, 2017). The results of the survey were processed in SPSS. The variables were grouped into each of the five scales (including positive interdependence) using the median. I analysed pre- group work activity (before intervention) and the types of positive interdependence with descriptive statics of the survey.

3. Evaluation phase. It included an evaluation of the approach and recommendations for further design. I analysed and compared pre and post group work activity (after intervention) and the types of positive interdependence with descriptive statics of the survey. The results were compared with the pre- group work activity survey. I used text analysis to study the open questions of the course evaluations and the FGDs to identify which characteristics of positive interdependence where achieved during the group work.

Results and discussion

Descriptive phase

This section presents the results of the descriptive phase and it is structured around the sub-questions, qualitative data, literature review and quantitative data.

Students' perception of group work assignments and types of positive interdependence

Above all students are positive and value group work. As one student stated:

> "For me group works is really important for the UPM course and they are the backbone because during those group works students learn a lot. So that's one thing we cannot do without in UPM class"

In the course evaluation, one student specified that group work is particularly helpful during certain phases of the work such as sharing ideas:

> "Group work is good especially in the analysis of data, you can learn some ideas from the other group members and build on your skill" […] "It allowed sharing of ideas with colleagues"

A recurrent positive issue about group work during the FGD was that students appreciate the learning from different and each other's backgrounds, skills and discussion. This is in line with studies that emphasize the cognitive perspective in group work (critical thinking) and social cohesion in particular. Slavin (1996) explains the importance of group interactions and how students learn from each other since "higher- quality understandings will emerge" as a result of the discussions (Slavin, 1996, p. 49).

The three types of positive interdependence (Figure 1) emerge from the interview and FGD but with different degrees of prevalence.

1- Outcomes / end state interdependence

For some students the main goal and motivation was to finalize the assignment in time and successfully. As one student put it "you need a common output".

The importance of group integration in positive interdependence can be recognized in the words of this student: "For within the group I think you need a kind of 100% interaction because if you don't integrate well the assignment will not come out well". Therefore, providing a good output of the assignment was the motivation for that group to seek for integration within the group members.

A different type of motivation was present in students that received a scholarship. They were motivated to help each other to obtain a final group mark above the threshold required by the scholarship regulations.

Working together did not prevent that some students recognize individual learning goals as well. As one of the students explains:

> "My goal was, regardless of whether we have to finish the assignment; I had to understand all the aspects of the assignments. For instance, if it was about spatial analysis and even if I am not the one doing the spatial analysis I have just to do it and get to know how has this person done the spatial analysis"

Above all, several students perceive the need to bring –as one student put it- "different strengths together to succeed".

2- Means interdependence

From all the forms of positive interdependence means interdependence was the one that students discussed most about during the FGD.

The tasks and roles are clearly divided within the group and they are interdependent of each other. However, some students complain that they remain in their role and expertise throughout the course:

> "So if I am assigned to do the things that I am able to do then I was continuously doing GIS work but I am not learning how to become a planner. So you should assign different people to different works so you can learn something else".

All the students recognize the existence of a process of negotiation to identify skills and distribute tasks. Before starting the group work, students divide the tasks based on their existent skills and they negotiate who is doing what. One of the interviewees explains this process:

> "First of all, when setting the TOR, I mean the division of labour, we tried to pick what you are good at, what you think you can handle comfortably or even with some effort. If you are not very sure about a particular section, it makes no sense to pick it…because then you don't deliver".

Another student added that the "most important thing is to coordinate all the work. You need to give…divide the work into several parts and everyone should complete their own part". This negotiation process seems to be a pre-requisite for the fulfilment of expected outcomes. It requires strong social skills and determines the importance of social cohesion in the group. In some cases, this seems to be challenged by problems of communication among members. Some students complain that some participants were absent during work and did not communicate with the rest of the group.

In terms of resource interdependence, each member of the group has parts of the resources needed to complete the task. This is confirmed by one interviewee, and particularly in relation to resources provided to each of the groups by the teachers:

> "One of the best things about assignments in UPM or ITC is that most of the resources such as data you find that is provided or is from case studies, from real life projects. So you find each and every student is able to access that".

3- Boundaries interdependence

Boundaries among individuals and groups will also determine positive interdependence as they will determine who is interdependent with whom. From the analysis of the interviews, it seems that the environmental interdependency subcategory (*where* students work) plays a role in this but neither the distribution of the furniture nor the LMS had been designed considering that aspect.

The international character of ITC may be the identity that binds together members in a group. From the text analysis no outside enemy interdependence was observed (negative interdependence with another group); on the contrary, several students indicated that the collaboration transcends the boundaries of their own group:

> "If we had a group discussion the class was the perfect environment because at the class you were able to know what the other groups are doing, are you also at the right direction and the lecturers were able to pop in and see if you are working well. So the classroom was the perfect place for group discussion"

Another student further elaborated on inter-group cooperation:

> "We were able to solve any difficulties that arise among, for instance if it is a group that has a difficulty for instance in analysing flooding, they do not know how to use the tool, they are able to get the way or to get the skill from another member form another group".

In terms of environment interdependence, students prefer to work in a classroom designated for group work as they can consult each other (within the groups and across the groups), "the classroom was the perfect place for group discussion". Lecturers also came in to respond questions or support students. In case of extra work required to reach a certain deadline, students use the facilities at the ITC Hotel (the student accommodation provided to international students enrolled in ITC courses).

Current obstacles that hinder cooperation during group work and types of interaction

Most of the obstacles that students mention relate to social cohesion (e.g., group formation) rather than motivation (lack of goals or insufficient rewards). In terms of motivation, some students find that the weight of

the group mark is too low (in the case they mention they suggest that it should be 50%, equally to the individual reflection report). The pressure to achieve a certain group mark above threshold due to sponsor or scholarship regulations was also mentioned as an obstacle.

Several obstacles related to social cohesion and means interdependence were mentioned during the interviews. Some students prefer to choose the members of the group themselves (as they know the skills and capabilities of their potential partners) and even completely refuse to work with others (at least one case was mentioned during the interviews). The later generated conflicts especially when a lecturer allowed those students to work individually and they were exempted to integrate with the other groups. One student also reflected that some short course participants (those that are enrolled only for a particular course and not the full MSc) probably had different motivations to work in groups:

> "There are people that come for short courses…their motivation is different from ours. Some of the groups that collapsed had this kind of people who came here for a SC [short course]. Maybe their main motivation was to go to Amsterdam Friday night…this kind of things creates a problem"

Finally, some students feel trapped in the role that was assigned to them in the group work (e.g. "the mapmaker or the GIS expert") and they must conduct that role throughout the course. Rules on group dynamics are present in the group assignment but they seem not to motivate students to cooperate or to facilitate social cohesion. It is worth noting that none of the students mentioned boundaries interdependence elements hindering cooperation. From this, and the staff meeting discussed in the following section, it was clear that in the design phase social cohesion and means interdependence should receive special attention.

Types of positive interdependence explicitly stated in previous UPM assignment

The UPM group assignment that has been used in the past (The Sustainable City, cohort 2017-2019) only included a separate section with brief indications on groups dynamics to determine roles (e.g. coordinator and reporter). No rewards for group work or clear objectives for the need of group co-operation were reflected in the rubric. During a meeting with teachers involved in group work I also identified current challenges (e.g. lack of specific objectives in the study guide that justify group work). One of the outputs from that meeting for the design phase (also in coincidence with the literature) was to have a cohesiveness building and group dynamics activity.

Types of tools students use in and outside the LMS for group interaction

During the FGD students indicated that they mostly use WhatsApp™ groups to make appointments and Google™ Drive or Dropbox™ to exchange and share data outside the LMS (that cohort had used BlackBoard™). Eventually e-mail is used as "sometimes Google Drive does not work". From the FGD it came clear that the design of the computer-supported collaborative learning approach could incorporate elements to facilitate means interdependence (e.g. facilitate discussion and sharing of data) but other elements related to social cohesion and group dynamics should be conducted in classroom. The next section discusses the literature review on computer-supported collaborative learning. Some of the studies show comparable results.

Computer-supported collaborative learning

Research on computer-supported collaborative learning shows that learning management systems (LMS) enhance collaboration (Jaldemark et al., 2018). In particular, group interaction usually increases significantly in the phase of project where students need to exchange work (Taylor, 2005, p. 35). Asynchronous interaction can be facilitated by computer-supported environments and offers advantages to collaboration such as reflection. Furthermore, "document sharing communicates project focus and demonstrates progress toward the final deliverable. Autonomously intra-group interactions —discussions, problem solving, sharing, revising,

reviewing, and commenting are all important learning opportunities" (Taylor, 2005, p. 35). Contrariwise, in the University of Twente a report showed that group collaboration is hardly used within the LMS (i.e. BlackBoard™). Students choose to use tools outside the LMS (i.e. Whatsapp, Dropbox and Google-tools). In the faculty ITC the function "groups" in BlackBoard was only used by 9% of the respondents (University of Twente, 2015).

In a project carried out for the Media Studies Seminar at the Katholieke Universiteit Leuven, computer-supported collaboration was used to facilitate positive interdependence (Buelens, Mierlo, Bulck, Elen, and Avermaet, 2005, p. 129). The authors indicate that to favour high positive interdependence they created a fair division of tasks "by partitioning group work into mutually connected sub-tasks, and by advising about role and turn taking within subgroups". The authors further promote means interdependence, and to enhance individual accountability and responsibility, they subdivide the task in smaller units and students have to peer assess their contribution within the group at four points during the academic year. Some of the tools mentioned by the authors were aimed at facilitating *information delivery and information exchange* between students (e.g. digital drop boxes, group pages, and group calendars). To prepare (and follow up) regular face-to-face meetings, *asynchronous communication tools* (e.g. group email and group discussion forums) were also provided. Some elements of boundaries interdependence are observed in this project as the authors claim that "besides facilitating group work in a direct way, having a virtual group space at one's disposal was also intended to enhance a feeling of belonging to a group" (Buelens *et al.*, 2005, p. 129).

There are claimed benefits related to the use of social media to facilitate interaction and sense of community within groups. Some authors claim that current students as "digital natives" tend to use social media as their primary source of information (Ahern, Feller, and Nagle, 2016). These authors report that students prefer "unofficial" channels of communication instead of "official" channels (e.g. LMS or e-mail). The choice of using unofficial channels like Facebook seems to be related to the easy to access characteristic of Facebook, which motivates them to interact with each other.

Results of cooperative learning questionnaire before design

Table 1 shows the results of the cooperative learning questionnaire. This was used to measure the level of positive interdependence perceived by the students in the cohort 2017-2018.

Table 1 Cooperative learning survey cohort 2017-2018

		Cooperative learning perceived by students				
		Positive Interdependence	Individual and group accountability	Promotive interaction	Interpersonal skills	Group processing
N	Valid	18	18	18	18	18
	Missing	0	0	0	0	0
Mean		4.3333	4.3333	3.9444	4.1944	4.1389
Median		4.0000	4.5000	4.0000	4.0000	4.0000
Std. Deviation		.56880	.56880	.78382	.59752	.63722
Range		2.00	2.00	2.50	2.00	2.00
Minimum		3.00	3.00	2.50	3.00	3.00
Maximum		5.00	5.00	5.00	5.00	5.00

Note. Likert scale 1-5 (1 strongly disagree, 5 strongly agree)

Promotive interaction is the scale with the lowest value and the highest standard deviation (Table 1) this can also be observed in the percentage of responses in some of the items (Figure 2) such as in questions 19, 14 and 8). The disagreement in the responses on question 8 "we cannot finish an activity without the contribution of our colleagues" could be explained by some specificities in the group related to the type of sponsor or funding rules students have. As some students explained, if they must take over a task from someone else to finish the work and obtain a higher mark, they will do it, in particular if they feel the pressure to obtain a higher mark due to sponsor regulations. In the group dynamics section of the previous UPM assignment there was no indication given to the different expectations students may have while starting a group work.

The literature shows the importance of sharing material in order to facilitate positive interaction (Buelens *et al.*, 2005, p. 129). Yet, 17% of the students disagree that sharing materials is important (question 13 in Figure 2). In the design phase social cohesion, means interdependence and sharing facilitation receives special attention.

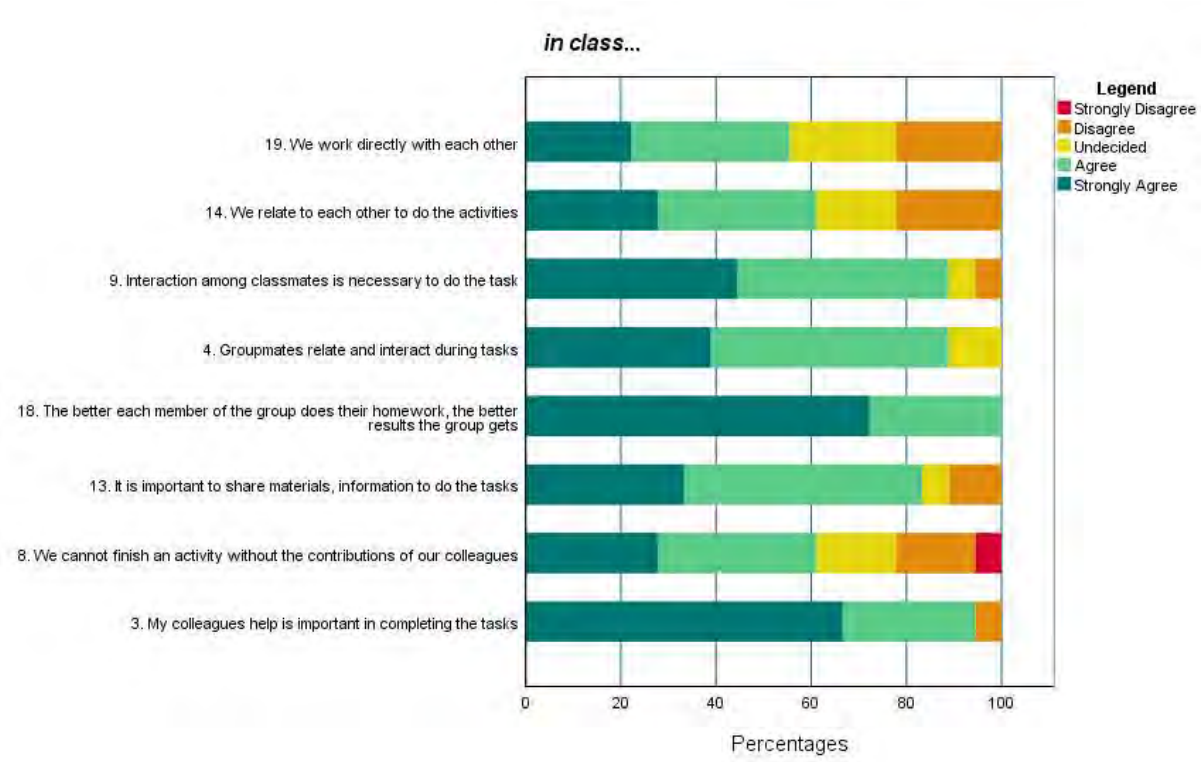

Figure 2 Promotive interaction (19, 14, 9, 4) and Positive interdependence (18, 13, 8, 3) responses students (cohort 2017-2018).

Design phase

Based on the results of the descriptive phase and the literature review I addressed two key issues during the design phase: 1- improving social cohesion through group dynamics workshop and 2- facilitating collaboration in CANVAS through asynchronous tools.

To improve social cohesion and group dynamics, I had a meeting with teachers involved in group work and we identified the main obstacles in group dynamics. We incorporated a group dynamics workshop the first day that the group assignment was presented. The other main element of this approach was incorporated in the

formulation of the assignment and in the design of the course material in CANVAS. We paid attention at the following dimensions of positive interdependence.

1- Outcomes / end state interdependence

We included a peer assessed item in the rubric for "active group participation" including these items:

> "Rate your group members. Rate yourself at your own name on:
>
> a- "Active participation in group discussion" (contributing with ideas, discussing, communicating)", and
>
> b- "Active working on agreed tasks (according for example the group contract)".

The possible responses ranged from 1 (contributed scarcely) to 5 (contributed significantly). We intended to incorporate this peer assessment using an LMS extension called WebPA (which had been functional in BlackBoard) but it was not possible in CANVAS. The assessment was conducted in Google forms.

We included in the rubric 5 points (out of 115) to every student that collected green space data and shared it to the rest of the groups.

One of the outputs of the group dynamics workshop was a group contract. Each group had to sign a group contract where they also made explicit their expectations (e.g. if they aim at having a higher mark due to sponsor). Each group uploaded their group contract in CANVAS within the group home page.

2- Means interdependence

In CANVAS we included collaboration tools and instructions to facilitate cooperation and communication. They included group pages, group work discussions page and a group dynamics pages with invitation to the group work dynamics workshop. We included videos (tutorials) on how to use these tools.

Each group received its own group home page where they could upload files, share data, and create group discussions. The structure of the group page was pre-designed to stimulate cooperation –i.e. folders included names such as shared data and shared literature.

The group assignment pages included the instructions for the assignment and hyperlinks to group pages and general discussion section for group work questions.

3- Boundaries interdependence

The classroom was divided in two spaces, one for lectures and group presentations (traditional classroom arrangement) and one for group work (five tables and workshop material were always available in the room). Students were encouraged to appropriate the space and hang posters if needed.

Student created a name for their group to stimulate positive identity interdependence (e.g. "The dreamers", "Bizck-T")

In the meeting with teachers involved in the course we decided that it was better that I (course coordinator) assigned members to each of the group. Five groups were preassigned mixing gender, country of origin/continent and course duration (2 years MSc or short course). In total, there were three groups of five members and two groups of four members. One of the students indicated during the FGD that their preference was to choose themselves the members of the group but, on the other hand, they understood that in real life projects, and in particular, in the field of planning, they have to work within a team of people they do not necessarily choose.

Evaluation phase

This section aims to evaluate the design of the LMS. It compares the survey scores of the cooperative learning questionnaire before and after design and tries to find out explanations of possible changes.

The quantitative analysis shows a slight improvement in the perception of positive interdependence after the group work. The mode and mean in positive interdependence increased from 4 to 5 although the standard deviation and strongly disagreement responses increased (Tables 2 and 3). This can be observed in the statement *"we cannot finish an activity without the contribution of others"* with an increase of those who disagree from 13% to 33% (Figure 3). The statement "*It is important to share materials, information to do the tasks*" received responses that are more positive after the intervention. The percentage of students who perceived sharing materials as important increase from 52% to 71% (strongly agreed with the statement). From the qualitative analysis this could be explained by the positive perception that students gave to the group pages in the LMS as a place to share information within the group.

Table 2 Cooperative learning cohort 2018-2020 (survey a- before intervention)

		Cooperative learning perceived by students (PRE)				
		Positive Interdependence	Individual and group accountability	Promotive interaction	Interpersonal skills	Group processing
N	Valid	**23**	23	23	23	23
	Missing	**0**	0	0	0	0
Mean		**4.3478**	4.3478	4.1304	4.3261	4.3913
Median		**4.5000**	4.5000	4.0000	4.5000	4.5000
Mode		**4.00**[a]	4.00[a]	4.00	4.00	4.00
Std. Deviation		**.41106**	.50979	.64345	.46731	.39762
Range		**1.50**	1.50	2.00	1.50	1.00
Minimum		**3.50**	3.50	3.00	3.50	4.00
Maximum		**5.00**	5.00	5.00	5.00	5.00

a. Multiple modes exist. The smallest value is shown
Note. Likert scale 1-5 (1 strongly disagree, 5 strongly agree)

Table 3 Cooperative learning cohort 2018-2020 (survey b- after intervention)

		Cooperative learning perceived by students (POST)				
		Positive Interdependence	Individual and group accountability	Promotive interaction	Interpersonal skills	Group processing
N	Valid	**21**	21	21	21	21
	Missing	**0**	0	0	0	0
Mean		**4.4524**	4.2857	4.3095	4.4048	4.4524
Median		**5.0000**	5.0000	4.5000	4.5000	5.0000
Mode		**5.00**	5.00	5.00	5.00	5.00
Std. Deviation		**.96053**	1.06737	.96794	.70034	.68747
Range		**3.50**	4.00	3.50	3.00	2.50
Minimum		**1.50**	1.00	1.50	2.00	2.50
Maximum		**5.00**	5.00	5.00	5.00	5.00

Note. Likert scale 1-5 (1 strongly disagree, 5 strongly agree)

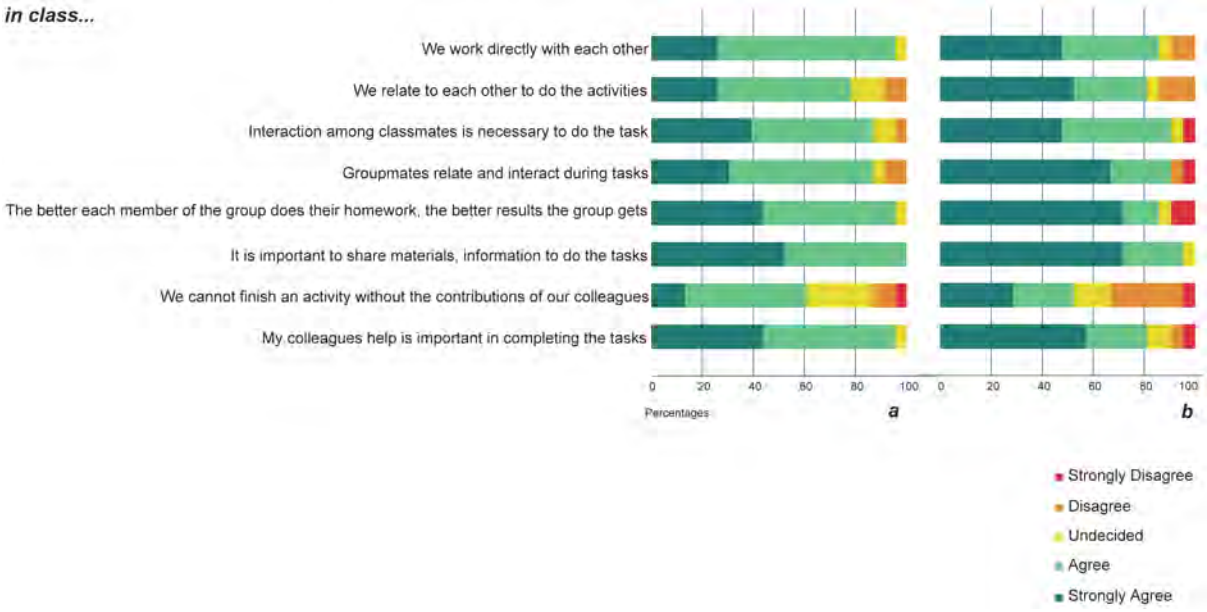

Figure 3 Promotive interaction (19, 14, 9, 4) and Positive interdependence (18, 13, 8, 3) responses students (cohort 2017-2018). a- before intervention, b- after intervention.

4. Conclusions and recommendations

The quantitative and qualitative analysis show that means interdependence is the most predominant characteristic of positive interdependence present in group work and positively perceived by the students. In the collaborative learning approach that was designed, both the group dynamics workshop (analogue/in class) and the group pages in the LMS seem to help in improving means interdependence.

Outcomes interdependence requires further attention as the objectives of the group work and the instructions uploaded in the LMS are not always clear.

In terms of boundaries interdependence, it seems that working in class in different groups is favoured by the students and even more when there is the possibility of contacting the staff in class (e.g. to receive feedback). No outside enemy interdependence was observed (negative interdependence with another group) but inter-group collaboration. Some students prefer to choose the group members, but they also recognize that in real life projects, and in particular in the field of planning, they have to work within a team of people they do not necessarily choose.

Johnson et al., (2007) summarize the core of positive interdependence by asserting that the precondition for any cooperative learning situation is that students "*must perceive that they are positively interdependent with other members of their learning group, that is, students must believe that they sink or swim together*" (Johnson et al., 2007, p. 23). The way that the LMS and the collaborative learning approach is designed and implemented could help them to "swim together".

Based on the implementation and the course evaluation these are the main recommendations:

1- Outcomes interdependence

- Add clear learning objective(s) to group work instructions.
- Make more explicit why group work is relevant for the assignment.

- Improve instructions and discuss with students face to face if they have difficulties interpreting the assignment. It should be noticed that the discussion page in the LMS where students could have posted questions on the assignment was not used by the students.
- Reconsider the use of tools embedded in the LMS to peer assess participation, preferably in consultation with students before starting the group work.

2- Means interdependence

- Keep in the LMS group pages as students valued the possibility of storing and sharing data within the LMS.
- Keep group dynamics workshops and evaluate possibility of introducing socials skills as part of the core training in the MSc.

3- Boundaries interdependence

- Keep the classroom as the place where students can work in group, physically interact with group members, across groups and staff.
- Invite students to choose a name for the group as it stimulates positive identity interdependence.
- Value and encourage inter-group collaboration.

Despite of the development of a computer-supported collaborative approach, I find that an LMS cannot substitute face-to-face teacher and learner meetings and interactions. Group pages in an LMS are useful but this paper shows that group discussion did not take place in the virtual environment and students prefer to communicate in class. Above all, students clearly appreciate working in class in a diverse and international environment.

The main strength of the scholarship of teaching and learning and the design-based research approach, was that it allowed me to reflect on my own teaching and perform research related to a specific teaching and learning activity in an urban planning course. As I indicated in the introduction, I would argue that in a diverse and unequal world educating (future) planning practitioners requires them to practice empathic and collaborative forms of learning as opposed to competitive ones. Within the UPM specialization and in courses like the "Planning Sustainable Cities" we emphasize, among others, the relevance of a better understanding of unequal quality of life conditions, spatial equity and social justice, and concepts of inclusive city and the just city (Fainstein, 2010, 2014). In this paper I have not discussed in detail the content of the planning course. However, it is not only *how* we teach and learn but also *what* we teach that will determine how empathic future planning practitioners will be.

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