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**SUPPORTING COLLABORATIVE WORK:
RECOMMENDATIONS FOR GROUP CREATION AND
COLLECTIVE WORK ASSESSMENT**

BY

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Abstract. This study focuses on the impact of the composition of groups of students on subjective psychological factors and the evaluation of collaborative work. The main results of collaborative work carried out by eighty undergraduate students show that the feelings of satisfaction and cohesion are different depending on the group composition. There is also a strong effect of affinity on peer evaluation and the accuracy of self-evaluation. It was also noted that some evaluation criteria for collaborative work are more interesting than others. Students are more likely to assess themselves more accurately when it comes to taking initiative regarding the amount of work done, or to an overall assessment of the work.

Keywords: Student groups; cohesion; satisfaction; self-assessment; peer assessment.

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1. Introduction

Being able to work in a team is a soft skill (Bouret *et al.*, 2014), which teachers are supposed to integrate and evaluate in their teaching activity. Currently, we can see that this skill is often considered to be acquired from the moment that pedagogical situations allow students to work in groups. However, working together, collaborating to achieve a goal is not a sufficient condition for developing this skill. Moreover, the idea of collective work is often at odds with the representations that teachers have. In practice, teachers sometimes prefer to assess the skills that they taught whereas the students estimate their level in a global way, in relation to all the work carried out in the training program. Also, the execution of the group project, is far from what the teacher had in mind initially. Thus, we observe a collective execution of the work by the students, but for a set of work to be produced, it is not unusual to see “projects” carried out by a single student with a formative evaluation that will benefit several. This collective approach is a little different from what the ability to work in a group implies. Indeed, carrying out collaborative work involves interactions and actions from each member of a group to form a collective result, and not working separately by dividing up the tasks (Gangloff-Ziegler, 2009; Dillenbourg, 1999).

In this study, we explore three leads regarding the issue of pedagogical support for the development of this group work skill: the effect of the composition of the groups on psychological factors, peer evaluation and the effectiveness of self-evaluation of collaborative work.

1.1. The Composition of Student Working Groups: An Impact on Subjective Psychological Factors

First, we thought it was important to question ourselves on the constitution of the groups and how this modality can have an influence on collaborative group work. How do students choose the members they wish to work with? Does the composition of a group in a pedagogical situation have an impact on individual feelings throughout the work to be carried out collaboratively? To answer this question, we looked at the literature works on the effects of group composition on the feelings of satisfaction and team cohesion.

Some authors define team composition as the configuration of individual characteristics within a group (Levine and Moreland, 1990). It has been shown that composition can have an impact on work through its effect on certain relational processes such as conflict or trust (Le Pine *et al.*, 2011). According to Hansen (2006), in the context of university projects, students are generally led to form two types of groups: the groups formed by the teacher and the group formed by the students.

When the groups are formed by the teachers, a technique that is particularly used is random assignment. The empirical results found in literature have shown the benefits of this type of composition. McClelland (2012) points out that when students are confronted with a collaborative work situation with randomly selected individuals, they will be out of their “comfort zone”. This position then requires efforts to mobilize their skills to make the best use of them. The results of his study showed that random assignment increases individual abilities as well as learning capacities. This finding is shared by several authors who argue that collective learning is more effective in groups whose members did not know each other before working together (Marsick and Watkins, 2001; Laird, 1985). Hernandez (2002) suggests that the groups randomly formed by teachers can result in a positive learning experience for the students. Blowers (2010) justified this hypothesis by stating that random assignment is a collaborative modality that the students will later find in a professional context.

The second category of team composition is the composition made by the students themselves. Students prefer the groups in which they have chosen the members, but admit to wanting the teacher to give them direction (Alexander and Stone, 1997). Chapman *et al.* (2006) also found benefits in groups formed by the students. In their field experiment, conducted with 583 students in groups of 2 to 6 members in a business and marketing school, the authors administered questionnaires to students at the end of the semester during which they had to achieve a team project. The results showed that students who had chosen their own team communicated more (with each other), were more enthusiastic, were interested in the other members and had more confidence in the ability of their group.

Thus, faced with the positions noted in the literature and if several works have revealed the positive impact of group composition mainly on the performance, other works have also shown an effect of these group compositions on subjective psychological factors such as the perceived satisfaction and the cohesion perceived by its members.

Satisfaction is “the positive emotional state that results from an individual's assessment of his or her work experience” (Locke, 1976). Group satisfaction is a recurring assessment in the literature on work teams, which shows a consistently positive impact on the different social processes and group performance (Zedda *et al.*, 2017).

Cohesion can be defined as “a dynamic process that reflects the tendency of a group to stay united in the pursuit of its goals, in order to satisfy the emotional needs of its members” (Carron *et al.*, 1998). In the past, cohesion has been demonstrated to have an impact on the work of student groups, particularly through its association with motivation (Gu *et al.*, 2011).

Thus, if in the literature, the composition of student groups has shown to have an impact on satisfaction and the feeling of cohesion, which are

important factors in the conditions of success of a collective work, we therefore assume that the stronger satisfaction and cohesion are, the more the students will be motivated to work together and so to develop collaborative work skills.

1.2. Peer Assessment

Evaluating group work is a complex activity for several reasons. It is difficult for a teacher to assess the group work activity. Asking students to assess the work of their group and its members can be a way of dealing with this pedagogical difficulty, but it can also be a way of training them to the assessment activity. Indeed, evaluating the work of others in an objective way, especially when it involves people with whom we have an affinity, can be difficult. And learning how to evaluate others is a skill to be developed to become more professional. We have therefore tried to explore how students evaluate others in a group: on what criteria and according to what factors?

Assessment is traditionally used to obtain information about students' learning processes and to improve their abilities (Pandora and Mardapi, 2017). Peer assessment is defined as the act by which individuals consider the amount, level, value, quality or success of a product or learning outcomes of peers of similar status (Topping, 1998). Within a classroom, the students have different levels of affinity with each other, some don't speak to others, others are long-time friends. When, in a team, individuals with different levels of affinity work together, peer evaluation is a way to enhance interaction and the objectivity of evaluations (Azarnoosh, 2013). We can assume that, in the hope of being objectively assessed by their peers, the students will want to be as objective as possible in their assessments. In a study by Azarnoosh (2013) conducted on students from a foreign language teaching background, the authors measured the impact of the affinity level of the members of the class on the evaluation of a written assignment by peers. This assignment consisted in writing in a foreign language on specific topics given by the teachers. The authors had made a sociogram based on the students' affinity by asking each participant to give them the names of three people in the class with whom they were the closest. The peer evaluation consisted in estimating the language level of the students they were evaluating on different established criteria. The results show that the assessments of the peers who were friends are not significantly different from the assessments of the peers who are not friends. Moreover, regardless of the level of affinity, these assessments were not different from the teacher's assessments, suggesting some objectivity in the assessment. Thus, we can assume that peer assessment is an effective tool to identify and communicate the important criteria in a teamwork.

1.3. Effective Self-Assessment through Peer Review

Each person lives this collective work experience according to feelings but is rarely able to evaluate it objectively in order to be able to progress on these aspects of collaborative work. However, knowing how to evaluate one's own work in relation to the one of others is necessary to develop one's sense of personal effectiveness (Bandura, 2005). In addition to our interest here in the mechanisms needed to set up appropriate collective work, we are interested in how each member self-evaluates his or her participation in the group, in relation to the evaluation that the other group's members can make of this member's work themselves. We have thus attempted to explore how students self-evaluate themselves and others in a group: on what criteria and according to what factors?

In order to progress and to motivate themselves, students need to increase their sense of effectiveness (Bandura, 2005; Zimmerman, 2001). This is achieved by self-evaluating one's own work in relation to the work of others. The perception of peers is therefore very important. To feel effective, we think that the student must develop a certain accuracy in this self-evaluation, i.e., the closer to peer evaluation the evaluation is, the more effective the student will feel. Self-assessment in a group work context is thus a strategy for students to get involved in their task and a guide to regulate their learning (McMillian and Hearn, 2008). For the individuals being assessed, peer assessment allows them to focus on what is considered quality work. Feedbacks help to be productive by preventing an individual from making the same mistakes (Bangert-Drowns *et al.*, 1991). Peer evaluation helps to compare to benchmarks, and to indicate the gaps that need to be filled to improve. Oppl (2017) emphasize in their study that it is important in collaborative work that the individuals engaged in the task, explicit their point of views on the task itself, to adapt the construction of a working pattern. This is underpinned by the fact that individuals need to develop a shared understanding of their interactions in the work process (Škerlavaj *et al.*, 2007; Stary, 2014). Furthermore, while this assessment modality may cause anxiety, it improves the acceptance of negative feedback, self-confidence, empathy, personal responsibility, and motivation (Topping, 1998). In Azarnoosh's (2013) experiment, the results also show that being engaged in peer evaluation positively changes the students' perceptions of the activity.

The nature of the criteria can also be important in the evaluation, whether personal or collective. Let's take the example of three criteria that have been studied in the literature as predictors of the final performance: team spirit, use of skills, and initiative.

Team spirit is defined as "psychological attachment to the group" (Turel and Connelly, 2012). It describes the feeling that team members share towards the group and their sense of collectivism, especially in overcoming failures and

conflicts between members in order to achieve common goals (Silva *et al.*, 2013). According to Boyt, Lusch, and Mejza (2005), team spirit is associated with helping behaviors among members, loyalty, enthusiasm, and devotion. In a field experiment conducted on 250 teams from a manufacturing firm, researchers measured the links between team spirit and team performance. Performance was measured by two indicators: the achievement of objectives and the respect of project deadlines. The results reveal a positive link between team spirit and performance (Ratzmann *et al.*, 2018).

Another studied criterion is the use of skills. Competencies are defined as “the knowledge, skills, and personal characteristics required to be effective in a job defined by standards” (Crawford, 2007). In a longitudinal study conducted on 57 student teams formed as part of a management course, the students had to compete with other student teams in a simulation of automobile companies (Mathieu *et al.*, 2015). The performance was measured by the fictitious economic level of the teams calculated by specialized business simulation software that the teams had at their disposal. The results reveal that individual skills in a team are significantly related to performance.

The third criterion is individual initiatives. It occurs when an individual voluntarily takes an active approach to work beyond what is formally required (Frese *et al.*, 1996). Taking initiative is sometimes linked to performance in the literature as it suggests that the individuals with a high level of self-help are particularly active in taking relevant information and planning their work effectively (Wall *et al.*, 1992). Baer and Frese’s experiment (2003) with German professional teams suggests that the level of individual initiative can create a climate of initiative within the team and that taking initiative also creates a sense of security within the team. This feeling of security, in turn, facilitates initiative.

These three criteria show the importance of communication and view sharing in collaborative work activities. In his study on the evaluation using the technologies of the participation of the members of a group of engineering school students, Boland (2010) suggests characterizing the work requested according to these three criteria as well as the presence, the quantity and quality of work. Each student must evaluate the work of the members of his/her own group.

1.4. Assumptions

The state of the art presented provides answers to our questioning and leads us to formulate the following three sets of assumptions.

Firstly, if the modalities of group composition do not seem to have any effect on the final performance on the requested task, they could have an impact on psychological factors such as satisfaction and cohesion.

Secondly, we question ourselves on how the members of a work team can evaluate their peers and assume that the affinity perceived between the members of a group should not influence this peer evaluation.

Thirdly, since self-assessment has been demonstrated as an important activity and skill in the literature, we think that the composition of the working group, if chosen by its members, can help to improve the accuracy of self-assessment and have an impact on the sense of self-efficacy.

To test these hypotheses and to deepen this knowledge on the evaluation of group work, we choose to carry out a study with students and within the framework of pedagogical productions that require teamwork.

2. Methodology

2.1. Participants

80 second-year students (17 women and 63 men) preparing a bachelor's degree in Computer Technology at the University of Montpellier in France (IUT), between 18 and 25 years old ($m = 19.56$ years old, $sd = 2.25$) participated in the study. All the students took part in two group projects. The composition of the groups differed from one project to the other. For the first project $N = 49$, the students could form their own team. For the second project $N = 79$, the participants were randomly assigned to working groups. Each working group consisted of 3 to 6 members.

2.2. Material

To measure teamwork satisfaction, we used a scale developed in the experience of Oetzel *et al.* (2012), consisting of four items. This scale allowed the authors to measure the effect of team composition on several collective variables such as satisfaction. The answers were measured on a five-point Likert scale (1 = strongly agree to 5 = strongly disagree), which had a good internal consistency in the original validation (.87).

To measure team cohesion, we used the QAG or Group Atmosphere Questionnaire (Heuzé and Fontayne, 2002). The QAG is the French adaptation of the Group Environment Questionnaire (Carron, Widmeyer, and Brawley, 1985). The French scale, composed of 18 items, measures cohesion based on four factors: integration into the group on the task level (internal consistency = .79), integration into the group on the social level (internal consistency = .83), individual attraction to group tasks (internal consistency = .83), and individual attraction to socialization within the group (internal consistency = .71). The participants were asked to respond on a 9-point Likert scale (1 = strongly agree to 9 = strongly disagree).

To evaluate the level of affinity between the members of the same group, we did not find a scale in the literature, and we identified four levels to be contextualized with the situation in which the study is conducted. To the question “Did you have any affinity with this person before starting the project”, students could answer: “Not at all, we had never spoken together”, “Not really, I knew him/her by sight”, “Yes, but I don’t know him/her”, “Yes, he/she is a friend”.

Finally, the questionnaire developed in this study (the TEAM questionnaire) consists of six items, with one item corresponding to each factor. This questionnaire is taken from Boland's study (2010) and duplicated in two versions: one version for each group member to evaluate him/herself (e.g., “you took initiatives during this teamwork”) and another version for each group member to evaluate each member of his/her own group, then corresponding to the evaluation of one member (e.g., “this group member took initiatives during this teamwork”). In addition to these six factors, a general assessment of the overall appreciation of the group work is asked from the participants following the same scheme. Each item is scored on a five-point Likert scale (1 = I disagree completely; 5 = I agree completely).

2.3. Procedure

Considering two separate projects, the students must form two different working groups (one per project). For the first project, the composition of the groups is random and imposed: the teachers randomly assign a number to each student. All those who have received the same number must form a team. In the framework of this research, we call these groups, the random teams (RT). For the second project, the students can form the groups as they wish. These are the teams formed by the students (ST). In both projects, the students have to carry out a creative work related to their university course, in the second year of Bachelor’s degree in Computer Science. For the first RT project, the aim is to simulate a company creation process and for the second RT project, to design a project in computer science based on a customer’s request (e.g., website, games, ...). The first RT project is accompanied by a teaching team for 3 hours per week within 8 weeks. The project is evaluated under the form of an oral presentation and several documents that deal with the organization of the created company, in economics, management and human resources terms. The second ST project is accompanied by tutoring: each group of students is followed by one or two teachers and must participate in meetings, hand in reports and progress reports throughout the semester (about 14 weeks).

A first data collection with questionnaires is carried out when the students complete the first RT project. This is then spread over four days, for a duration of approximately 30 minutes per session. At the beginning of each course, we orally present the instructions for the questionnaires and have a

consent form filled in. After returning the consent form, all participants are asked to complete the questionnaires listed above about working in teams on the computers they use to work. A link available on their personal university spaces then connects them to the online questionnaires (Google Form). The students must first answer questions that allow the experimenters to identify them and their groups. They must give their first and last names, their age and the working group they belong to. Then they answer questionnaires measuring satisfaction (Oetzel *et al.*, 2012), cohesion (Heuzé and Fontayne, 2002) and the TEAM questionnaire, the relevance of whose indicators we wish to validate. Through the latter questionnaire, students are asked to assess themselves and each member of their own group about seven indicators that measure collaboration.

Later that same semester, we ran these questionnaires again. This was for the second ST group project, i.e., the groups composed by the students themselves. We therefore administered the satisfaction and cohesion questionnaires and the TEAM questionnaire a second time to the students but concerning this second ST project.

3. Results

3.1. Group Satisfaction and Cohesion

To verify the effect of the team composition modalities (RT and ST) on the satisfaction and cohesion of the members, we used the student *t* (Table 1). Our hypothesis is that the satisfaction and cohesion rates are higher in the teams whose composition was randomly made (RT). After completing the questionnaires, it was found that RT team members were more satisfied ($t(80.82) = -3.2$; $p < .01$) and less cohesive ($t(59.97) = 3.52$; $p < .001$) than ST team members (Table 1). These results thus confirm our hypothesis regarding cohesion: the students felt more cohesion during their work when they chose their working group members, but they also contradict our hypothesis regarding satisfaction: the students did not feel more satisfaction at the end of the group work when they chose their working group members.

Table 1
Means (M) and Standards Deviations (SD) of the Results of the Cohesion and Satisfaction Questionnaires Depending on the Team Compositions

	ST (n=49)	RT (n=79)
Satisfaction	13.9 (4.00)	15.99 (2.96)
Cohesion	44.5 (16.36)	35.76 (7.51)

3.2. The Nature of Peer Review and the Level of Affinity

Here we wonder how the students can evaluate their peers and whether this evaluation is different depending on the criteria and level of affinity. In this case, we hypothesized that peer evaluation does not depend on the level of affinity.

In terms of criteria

On a scale of 1 to 5, regardless of the criterion, ratings are never less than 3.92 (SD = 1.14) on average (Fig. 1). The level of peer evaluation for the ST group for the criteria is significantly lower than that of the RT group peers for initiative ($t(229.41) = -2.58$; $p < .05$), team spirit ($t(228.98) = -3.35$), and teamwork ($t(228.98) = -3.35$; $p < .001$), presence ($t(201.39) = -5.83$; $p < .0001$), quantity of work ($t(221.25) = -2.86$; $p < .01$), quality of work ($t(216.39) = -3.39$; $p < .001$), and overall for general assessment ($t(229.55) = -3.79$; $p < .001$). This difference was not observed for the skill-based criterion ($t(225.6) = 1.45$; $p = .15$) even though the variation was reversed: the ST group had a higher peer rating compared to the RT group.

From an overall perspective, regardless of the team, there is little difference between the evaluations (Table 2). Indeed, most of the criteria used for this evaluation are fairly highly correlated with each other. The assessment of the amount of work carried out is strongly correlated with taking the initiative ($r = .65$) and the feeling of presence ($r = .73$). The other criteria are also slightly correlated (r between 0.4 and 0.6). Only the feelings related to the use of skills are weakly correlated with the feelings of team spirit ($r = .32$) and the quality of the work done ($r = .34$).

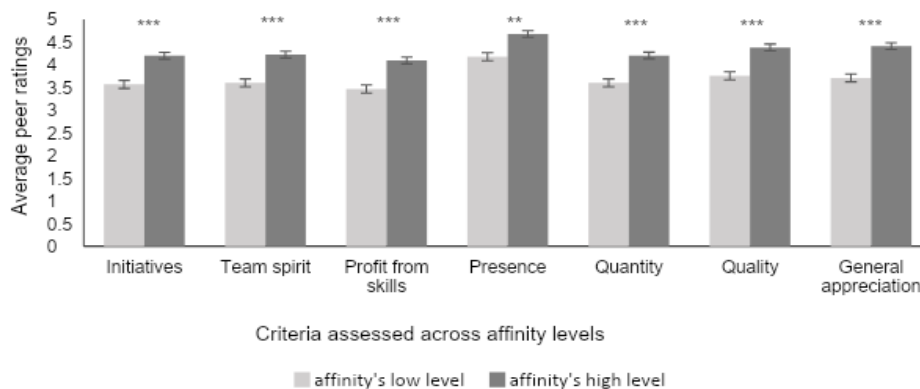


Fig. 1 – Results of peer reviews based on criteria and groups.

Note: Group comparison between ST (light grey) and RT (dark grey), with associated p-value (*** = $p < .0001$; ** = $p < .001$; * = $p < .05$).

Table 2
Inter-Item Correlation for all Conditions

	Initiative	Team spirit	Competencies	Presence	Quantity	Quality	General
Initiative	1	0.46	0.49	0.58	0.65	0.48	0.66
Team spirit	0.46	1	0.32	0.45	0.5	0.4	0.52
Competencies	0.49	0.32	1	0.46	0.51	0.34	0.48
Presence	0.58	0.45	0.46	1	0.73	0.48	0.65
Quantity	0.65	0.5	0.51	0.73	1	0.55	0.75
Quality	0.48	0.4	0.34	0.48	0.55	1	0.55
General	0.66	0.52	0.48	0.65	0.75	0.55	1

In terms of affinity level

We then look at how the RT participants assess their peers according to their previously reported level of affinity, the ST participants reporting very homogeneous levels of affinity. As a reminder, our questionnaire on self-reported prior affinity includes four response modalities: “Not at all, we had never spoken together”, “Not really, I knew him/her by sight”, “Yes, but I don’t know him/her”, “Yes, he/she is a friend”. Initial analyses show real differences when these levels are grouped into two categories: a low level of affinity (the first two modalities) and a high level of affinity (the last two modalities). These results indicate a split between low and high affinity levels. The evaluation of group members appears to be dependent on these two levels of affinity: $t(130.36) = -5.16$; $p < .0001$. The specific results for each scale show that the students who reported a previous high affinity score rated their teammates more generously compared to those who reported low affinity levels. This result is found for the scales on taking initiative ($t(148.67) = -4.68$; $p < .0001$), team spirit ($t(136.8) = -4.5$; $p < .0001$), using skills ($t(150.03) = -4.84$; $p < .0001$), presence at work ($t(116.7) = -3.96$; $p < .001$), quantity of work ($t(145.72) = -4.25$; $p < .0001$) and quality of work ($t(134.16) = -4.99$; $p < .0001$). We observe an influence of self-reported affinity on peer ratings for all the scales in our questionnaire.

Figure 2 shows the assessment scores according to affinity levels and each criterion.

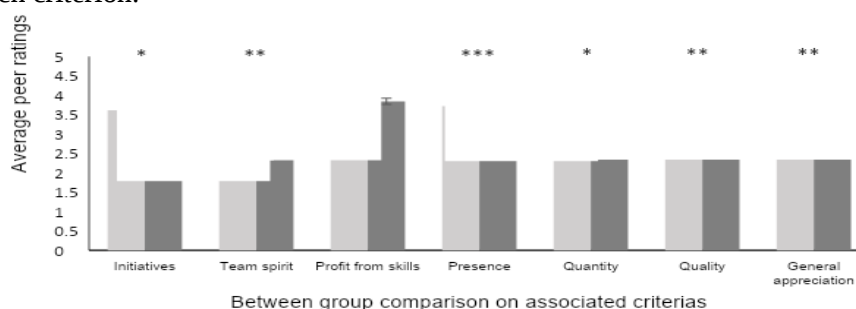


Fig. 2 – Average peer ratings on the questionnaire’s scales according to the declared level of affinity.

Note: Comparison of low (light gray) and high (dark gray) affinity levels, with the associated *p*-value for each scale.

It appears here that, contrary to our hypothesis, the reported level of affinity affects peer evaluation, i.e., the students with a higher prior level of affinity evaluate their teammates more generously than those with a lower prior level of affinity.

3.3. Assessment Accuracy

We calculated the degree of similarity between the self-assessment and the peer evaluation on our questionnaire. This analysis was conducted using the Bravais-Pearson correlation for the RT group and the ST group. We then assessed the similarity of the two groups in terms of their correlations using the Fisher transformation (Table 3). As a reminder, the hypothesis was that students working in a self-selected group should have higher correlations between self- and peer assessments than those working in a randomly selected group.

Table 3
Means, Standard Deviations, Correlations between Self and Peer Assessment within Groups and Intergroup Comparison of Correlations

Heading	ST (n=49)			RT (n=79)			
	Self-assessment	Peer assessment		Self-assessment	Peer assessment		
	Mean (SD)	Mean (SD)	Pearson	Mean (SD)	Mean (SD)	Pearson	Z score
Initiative	3.77 (1.07)	3.77 (1.07)	0.62	3.82 (0.9)	3.9 (0.91)	0.4	1.61
Team spirit	3.76 (1.16)	3.76 (1.03)	0.44	3.95 (0.88)	3.92 (0.87)	0.35	0.57
Competencies	3.84 (1.08)	3.84 (1.17)	0.49	3.81 (0.94)	3.81 (0.78)	0.28	1.32
Presence	3.84 (1.08)	3.84 (1.17)	0.47	4.46 (0.73)	4.46 (0.71)	0.43	0.27
Quantity	3.7 (1.1)	3.7 (1.28)	0.56	3.91 (0.69)	3.91 (0.94)	0.42	0.99
Quality	3.78 (1.01)	3.77 (1.09)	0.32	4.1 (0.83)	4.1 (0.75)	0.42	- 0.62
General	3.8 (0.87)	3.81 (1.1)	0.63	3.9 (0.83)	4.07 (0.84)	0.41	1.64

Any subsequent estimation of the strength of our correlations is based on Cohen (1988). The student's self-assessments are generally very similar to the member's assessments (Table 3). They are also highly correlated with those of others when the students selected their group members (ST) for general assessment ($r = .63$), initiative ($r = .62$) and amount of work ($r = .56$). However, globally, there is no difference in self-assessment accuracy between the two conditions, regardless of whether the students choose their teammates. Indeed, as a complement, we conducted a significance analysis of these coefficients between the ST and RT groups. Fisher's transformation analysis was conducted for each of the items (z-score in Table 3) and does not represent a significant

difference between the assessments conducted in the ST team compared to the RT team, since the value of the z-score never exceeded the lower or upper bound of $[-1.96; 1.96]$.

These results therefore do not allow us to confirm our hypothesis regarding the influence of group distribution on the correlations between self-assessments and those of the members of each team: the participants do not seem to assess themselves more accurately depending on whether they chose their team members. Nevertheless, the criteria of initiative, amount of work and general appreciation are criteria that are more fairly assessed in the ST group.

4. Discussion and Recommendations

4.1. Satisfaction and Cohesion

First, we expected certain marker effects such as cohesion and satisfaction on the feeling of collaborative work. Satisfaction seems to be a marker of the effective functioning of a collaborative working group, as opposed to frustration as a marker of inadequate functioning, according to McClelland (2012). In addition, this variable appears to be related to the way groups are constituted according to Connerley and Mael (2001). We therefore assumed that the students who are able to choose their team members would generate greater satisfaction from their collaborative work. The results of our study indicate the opposite effect: the students who did not make this choice reported higher satisfaction with their work. Although this effect is surprising compared to the original hypothesis, it echoes other studies that argue that group learning is more effective outside the comfort zone (Laird, 1985; Marsick and Watkins, 2001). Moving outside the comfort zone would encourage the emergence and development of latent soft skills. Indeed, group work activity, especially in imposed configurations, tends to require more learning on skills such as managing complex, ambiguous situations, and uncertainty, as well as communication and group work skills (McClelland, 2012), all of which are identified as soft skills by Schulz (2008). If we consider these studies in relation to our results, we can then consider satisfaction as an important marker of the effectiveness of collaborative work, but whose modalities of appearance are different from what we expected. Indeed, satisfaction is higher when the members of a working group do not choose each other. It is therefore likely that this type of organization leads to a decrease in the feeling of efficiency at the beginning of the collaborative work activity, for example, related to the difficulties of planning the achievement of objectives in a context that is difficult to control. Following this logic, the completion of the work would contribute to a comparatively greater positive feeling for these teams, compared to the teams in which the members choose to work together, because of the lower expectation of success and the greater number of obstacles supposed to be overcome.

The second factor we have identified is cohesion, which is supposed to reflect a relevant marker of a working group's functioning, explaining performance. Cohesion is relative to the success of goal setting and other steps to create adequate group dynamics and the achievement of goals subsequent to successful work as described by Oppl (2017) taken from the model of Bandara *et al.* (2007). In this framework, we formulated our second hypothesis: the students should feel a greater sense of cohesion during the course of their work when they choose the members of their working group. Our study shows congruent results with this hypothesis, since our tests do indeed reveal greater cohesion for self-selected groups of students. This element reveals an interesting element of reflection added to the satisfaction results. Indeed, we may wonder whether cohesion is not an independent marker of the effectiveness of group work. It would rather be a marker of the fluidity of work. Reciprocally, we can ask ourselves whether satisfaction would not be linked only to the final product of the work. To answer this question raised by this study, it would be useful to replicate the experiment by introducing as a dependent variable a criterion-based and objective evaluation obtained by the group, graded by the teachers according to an inter-rater agreement method, this method guaranteeing a better measurement through intersubjectivity (Boissart, 2014). Such a method would make it possible to acquire qualitative data (judgements) from teachers concerning collaborative work, while at the same time having a high degree of objectivity concerning quantitative data (formative evaluation).

In addition, we can make some recommendations for education professionals such as teachers regarding team composition and its relationship to satisfaction and cohesion. From a pedagogical perspective, constraining the composition of student teams increases the student's satisfaction with the accomplished work. We hypothesize that in a group composed by the teacher, being less enthusiastic than working in teams composed by the students themselves, the students should focus more on their work, and they should end up being pleasantly surprised by their group. They are forced to make more effort to adapt to the behaviour of the individuals in their teams, which, once completed, may increase the sense of satisfaction. On the other hand, choosing the members of one's group is a modality of composition that could consolidate the positive relationships already established between the students. According to Hassakhah and Mozaffari (2015), student-composed groups help to facilitate cooperation, communication, and acceptance among team members. Finally, it should be considered that these results should be verified on other populations since they concern undergraduate students with a technological background in computer science, who may be more accustomed to carrying out team projects than in other domains.

4.2. Settings for Evaluating Group Work

Students were asked to evaluate the work of their team members based on several criteria, predictive of the performance according to the literature. The results show that when the students feel that the team members provided a great deal of work, they also feel that the team members took initiative and were present. Feelings differ for only three criteria: someone who uses their skills is not necessarily a person with a team spirit or even a person who does quality work. Thus, to support teachers in evaluating collaborative work, we could recommend that they use three criteria that are explanatory of the work done: team spirit, taking initiative and making use of skills. The other criteria used are not necessarily useful for the evaluation and could make it more cumbersome. Furthermore, the low dispersion of results in the evaluation could be linked to the scale of the questionnaire: from 1 to 5 and the lack of precision in the meaning to be given to each point. Bandura, in his work on the scales to measure self-efficacy, recommends 100-point scales (Bandura, 2006). It may be that, in our study, this way of responding, which accentuates the level of subjectivity, may imply a weak consideration of the levels of response to be given with a preference for strong levels that are less involving for the respondent. Indeed, even if in this questionnaire, it is asked to judge the other's behaviour, if the scale is not precise enough, this judgement may be mixed-up with the subjective judgement about a person, which could generate a certain discomfort and lead to these strong observed levels. Replicating this study would give us the opportunity to develop a scale that we would pre-test and whose psychometric qualities would be defined after testing a population of students. This scale could allow us to validate the impact of the three criteria that stood out in our study: team spirit, use of skills, and taking initiative and experimenting with new ones.

4.3. Peer Evaluation Based on Group Composition Choices

We were also interested in the implications of the previous level of affinity reported by our participants on how to evaluate peers in a working group. As a reminder, we made the assumption, in light of the state of the art, that prior stated affinity would not influence the value of the evaluation. This hypothesis is invalidated by our results, showing an influence of this affinity on the evaluation made by the students. Moreover, this influence depends on the presence or absence of this affinity and not on the intensity of the affinity felt.

In addition, the students are more generous in evaluating their peers when they declare an affinity for them prior to the start of the assignment. These results were obtained from the students in the groups that did not choose their teammates, even though the overall assessment was less generous in the groups that did choose their teammates. This is a contradictory result because we had

postulated that the groups to which the choice of composition was left realized it on the basis of the presence of an affinity. This result thus shows that factors other than affinity influence these evaluations. Here are some possible explanations. First, as it was found that satisfaction is higher when the students do not choose their teammates, being, by chance, with someone for whom one has affinity reinforces this positive appreciation of the other. Secondly, the generosity of peer evaluations is always lower when the students choose their teammates, except for the criterion of “profit from skills”. This result is interesting because it emphasizes the importance of the task requested in each group: disciplinary skills are indeed more mobilized in the groups where the students choose their teammates. From this view, we can think that the group choices were also made on the participation of each individual to increase performance. Thirdly, and this is related to the previous point, there may be a methodological bias about the nature of the tasks in each team. Indeed, the working groups that chose their composition were not confronted with the same pedagogical modalities as the others: more autonomy, fewer imposed moments to meet physically and work together.

These findings lead us to advise education professionals to consider the affinity of the members when composing a group, when the students have to get involved in evaluating their peers. If such an assessment is necessary, consideration of the nature of the criteria to be scored is particularly important to consider the nature of the criteria to be marked so that affinity does not bias the rating. For example, grading the quality and quantity of the work of one’s peers, when those are the assessor’s friends, can be tricky if the members being assessed have not provided the expected level of work.

4.4. Self-Assessment and Accuracy of Peer Evaluation

Self-assessment has a central influence on the level of self-efficacy. This self-evaluation is also a means of taking a step back from the activity of the task that has been performed. Thus, the more this self-evaluation is carried out on objective criteria, the more it will influence the effectiveness of the task itself and therefore an impact on the level of self-efficacy. In our study, we notice that the accuracy of the evaluation is not dependent on the composition of the group, whether it is chosen by its members, even though we thought the opposite was true. Only the evaluations carried out on the criteria of initiative, amount of work and general appreciation are criteria that are evaluated more accurately when the students choose the members of their group. Let us note that the criterion presence does not present significant results on this correctness of evaluation even though we could think that it is an objective criterion: everyone should know if he/she has been present or if the others have been present. It is also observed that the evaluations are very little dispersed on the 5-item scale, whatever the criteria. The evaluations are therefore carried out on

feelings and are not attached to precise indicators of the situation. One possible interpretation is that these evaluations are not sufficiently guided by our scale and are not sufficiently explained by the students. The criteria may also not make enough sense to the students either. It would therefore be interesting to experiment with new criteria regarding the results of this study, such as participation in a specific activity, such as group coordination, respect of the rules, etc., and to contextualize the level of the items. However, the criteria “taking initiative”, “quantity of work” and “general appreciation” show that the students agree when they know each other. It can be assumed that the answers to the questions were oriented to personality or contribution in general and not to these specific work activities. This interpretation would be consistent with the idea that each student imagines the work in a collective global way over the whole training and not in relation to each pedagogical activity. It would therefore be necessary to work with the students on the representation of the elements that make up their training, and thus the competency-based education and training approach takes on its full meaning (Hodge *et al.*, 2020).

5. Conclusions

This study shows that the way the groups are composed has a positive and different impact on the students’ feelings depending on whether they choose their team members or not. Furthermore, there is an effect of the level of affinity on peer evaluations but also a difficulty for the students to make sense and be objective in their evaluations. These results deserve to be further explored in future studies in order to consider specific recommendations for teaching practices.

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SPRIJINIREA MUNCII COLABORATIVE: RECOMANDĂRI PENTRU CREAREA GRUPURILOR ȘI EVALUAREA MUNCII COLECTIVE

(Rezumat)

Acest studiu se concentrează asupra impactului alcătuirii grupurilor de studenți asupra factorilor psihologici subiectivi și asupra evaluării muncii în colaborare. Principalele rezultate ale muncii în colaborare desfășurate de optzeci de studenți de licență arată că sentimentele de satisfacție și coeziune sunt diferite în funcție de componența grupului. Există, de asemenea, un efect puternic al afinității asupra evaluării colegilor și asupra acurateței autoevaluării. S-a remarcat, de asemenea, că unele criterii de evaluare pentru munca colaborativă sunt mai interesante decât altele. Studenții sunt mai predispuși să se evalueze mai precis atunci când este vorba de a prelua inițiativa față de cantitatea de muncă depusă sau de o evaluare generală a muncii.