UNIVERSITEIT GENT

FACULTEIT ECONOMIE EN BEDRIJFSKUNDE

TWEEKERKENSTRAAT 2
B-9000 GENT
Tel. : 32 - (0)9 – 264.34.61
Fax. : 32 - (0)9 – 264.35.92

WORKING PAPER

The effect of team learning on student profile and student performance in accounting education

Evelien Opdecam[a]

Patricia Everaert[a]

Hilde Van Keer[b]

Fanny Buysschaert[c]

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[a]Department of Accounting and Corporate Finance, Faculty of Economics and Business Administration, Ghent University, Kuiperskaai 55/E, 9000 Ghent, Belgium
[b]Department of Education, Faculty of Psychology and Educational Sciences, Ghent University, Henri Dunantlaan 2, 9000 Ghent, Belgium
[c]Education Quality Assurance, Faculty of Economics and Business Administration, Ghent University, Tweekerkenstraat 2, 9000 Ghent, Belgium

Corresponding author: Evelien Opdecam, Department of Accounting and Corporate Finance, Faculty of Economics and Business Administration, Ghent University, Kuiperskaai 55/E, 9000 Ghent, Belgium, phone: +32(0)9 264 35 41, e-mail: Evelien.Opdecam@UGent.be

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Abstract

The first objective of this study is to investigate students' preferences for learning methods in relation to their learning strategy, motivation, gender, and ability. Two learning methods are considered: team learning and lecture-based learning. The second objective is to explore the effectiveness of the chosen learning method by comparing academic achievement between the lecture-based and team-learning groups. A quasi-experiment was administered, consisting of an untreated control group with a pre-test and a post-test, for a first-year undergraduate accounting class. Students choose one of the two learning paths and subsequently follow their chosen learning path. The results show that female students had a higher preference for team learning than male students. Furthermore, team-learning students were more intrinsically motivated, had a lower ability level, and had less control of their learning beliefs, but they were more willing to share their knowledge with peers. The team-learning approach also resulted in increased performance in an advanced accounting course while controlling for the differences in gender and ability. This beneficial impact of team learning on performance was not found for other courses, leading to the conclusion that team learning offers an appropriate learning method at the university level for a first-year accounting course.

Keywords: Team learning, cooperative learning, academic performance, MSLQ, instructional preferences

Introduction

Recently, a growing number of conferences, journals, and books have emerged that are dedicated to the quality of university teaching (Postareff, Lindblom-Ylänne, & Nevgi, 2008). Universities invest a considerable amount of time and effort into recognizing effective education (Trigwell, Prosser, & Waterhouse, 1999). Researchers have called for students to become more active participants in their learning process and for instructors to apply methods to increase their interaction with students (Kember 2009; Lammers & Murphy 2002). The concept of active learning has earned a prominent place in the current field of education because of its effectiveness (Bonwell & Eison, 1991), its improvement student learning (August, Hurtado, Wimsatt, & Dey, 2002), and its ability to increase students' participation (Matveev & Milter, 2010).

However, the new circumstances *in higher education* inhibit the active engagement of students in the learning process (Braxton, Milem, & Sullivan, 2000; Kelly et al., 2005). The situation in higher education has changed considerably during the last two decades as the massification of higher education has emerged (Trow, 1999; Tynjälä, Välimaa, & Sarja, 2003). Massification in higher education has resulted in an expansion of the student population (Tynjälä et al., 2003) and increased academic heterogeneity (Schoenecker, Martell, & Michlitsch, 1997). Furthermore, considering increased faculty workload, a cost-effective learning method is needed. Cooperative learning provides a potential solution because it can implement active learning in a large group setting (Sand-Jecklin, 2007). *Team learning* is a specific type of cooperative learning that requires an acceptable investment of time and energy from the instructor while inducing active learning in students. The core issue in team learning is that people learn not only from their own experiences but also from colleagues' experiences (Ickes & Conzales, 1994). The massification of higher education has resulted not

only in an expansion of the student population but also in a growing diversity of the student population (Trow, 1999). Therefore, today's students attend university with a variety of instructional preferences and educational needs.

Consequently, in response to the growing diversity in the student population, the current educational setting implemented two learning paths, and to address the need for a cost-effective active learning method, team learning was chosen as one of those learning paths. Therefore, *the first objective of this study* is to investigate the relationship between student preferences for team learning and lecture-based learning and related student characteristics. Differences in learning strategy and motivation, gender ratio, and prior achievement will be addressed. The *second objective* of this study is to explore the effectiveness of team learning in a choice situation. More specifically, this study investigates differences in academic achievement while controlling for differences in student characteristics. The current setting differs from previous studies in several ways. First, students made their choice in an authentic environment. In contrast with other studies in which preferences were measured using a questionnaire, students in this study made a real-life choice for the entire semester. Second, although there has been considerable exploration of gender differences and ability level, few studies have investigated the relationship of instructional preferences with motivation and learning strategies. This study relies on a *quasi-experimental research design* with a large cohort of first-year undergraduate students pursuing a path of either team learning or lecture-based learning.

Theory and Hypotheses

Student Preferences

Scholars have suggested that investigating students' preferences regarding their academic environment can help instructors to select the appropriate teaching strategies and to

structure the academic environment to better serve students' learning needs (Entwistle, McCune, & Hounsell, 2002; Hativa & Birenbaum, 2000). Sonnenwald and Li (2003) reported that students prefer different learning styles and strategies, implying that they have different ways of learning. Student learning preferences refer to student choices of type of classroom structure, whether in cooperation with peers or having no involvement with peers. Johnson and Engelhard (1992, pp. 385-386) stated that "these preferences have implications for effective instruction as well as for student learning. The study of these preferences may assist educators to better understand the different student responses to various classroom practices and help them design more effective, relevant instructional practices that engage a broader range of students".

Most of the literature concerning instructional preferences has focused on two areas: (1) how student characteristics are related to a particular preference (e.g. Engelhard & Monsaas, 1989; Wierstra, Kanselaar, van der Linden, Lodewijks, & Vermunt, 2003) and (2) how student achievement and student perception are affected when students are taught in their preferred instructional setting (e.g. Shankar & Seow, 2007; Sonnenwald & Li, 2003).

Regarding the first area of instructional preferences, Johnson and Engelhard (1992), for example, reported that in comparison with men, women prefer cooperative learning methods. In addition, Engelhard and Monsaas (1989) administered a cooperative attitude in school settings to 3rd, 5^{th} and 7^{th} graders. They found that less successful students reported a higher preference for cooperative learning techniques relative to more successful students. Regarding the second area, Johnson and Johnson (1989) found that some students are more predisposed than others to act cooperatively and that this disposition may influence how students cooperate with others. Students' initial attitudes toward teamwork significantly affect their performance. Specifically, students who experience more discomfort when engaging in teamwork and who have a higher preference for individual work perceive fewer benefits from

participating in teamwork and report less improvement in learning skills as a result of such an experience (Shankar and Seow, 2007). Meanwhile, students with a higher preference for teamwork generally report more positive experiences in such a situation (Shankar and Seow, 2007). The study by Chang and Tsai (2005) found that personal preferences toward learning environments such as classroom settings and/or structures of instruction are significantly associated with academic achievement, attitudes toward subject matters, and approaches to studying.

The current setting combines both areas and differs from previous studies in several ways. First, students made their choice in an authentic environment. In contrast with other studies in which preferences were measured using a questionnaire, students in this study made a real-life choice for the entire semester. Second, although there has been considerable exploration of gender differences and ability level, few studies have investigated the relationship between motivation and learning strategies and instructional preferences. This study addressed following specific hypotheses:

Hypothesis 1a: Gender is related to a preference for team learning or lecture-based learning in a university setting.

Hypothesis 1b: The ability level of students is related to a preference for team learning or lecture-based learning in a university setting.

Hypothesis 1c: The motivation of students is related to preference for team learning or lecture-based learning in a university setting.

Hypothesis 1d: The learning strategy of students is related to preference for team learning or lecture-based learning in a university setting.

Cooperative learning and team learning in higher education

Cooperative learning is one of the most commonly used forms of active pedagogy (Tsay & Brady, 2010). This instructional strategy is based on the social interdependence

theory (Johnson, Johnson, & Smith, 2007). In cooperative learning, students are assigned to small groups to complete a task, solve a problem, analyze a scenario, complete a project, or take a test. The founders of the social interdependence theory define a group as follows: "(a) the essence of a group is the interdependence among members (created by common goals) that results in the group being a dynamic whole so that a change in the state of any member or subgroup changes the state of all other members or subgroups and (b) an intrinsic state of tension in group members motivates movement toward the accomplishment of the desired common goals" (Johnson et al., 2007, p. 16).

Interaction with peers offers students the chance to learn not only from their own experiences but also from one another's scholarship, skills, and experiences. Cooperation will develop only under a certain set of conditions, which have been identified by the social interdependence theory, namely, (1) positive interdependence, (2) individual accountability, (3) social skills, (4) promotive face-to-face interaction, and (5) group processing (Johnson, 1989) (see Table 1).

Insert Table 1

In higher education, the literature follows two approaches regarding the value of cooperative learning techniques (Cabrera et al., 2002). One approach states that cooperative learning techniques have universal value for all students (e.g. Slavin, 1990; Tinto, 1997). The second approach emphasizes differences in student characteristics to argue for a differential effect of cooperative learning (Johnson & Johnson, 1989; Lundeberg & Moch, 1995). Advocates of the latter approach to cooperative learning call attention to the link between instructional technique and different student outcomes (Cabrera et al., 2002). This study will investigate the link between preferences for an instructional method and student outcomes.

Although many forms of cooperative learning exist, all require students to work in small groups or teams helping one another to learn academic material (Slavin, 1991). Student

team learning is one of the most thoroughly evaluated cooperative learning techniques (Slavin, 1991). Many definitions of team learning have been put forward in the literature (Decuyper, Dochy, & Van den Bossche, 2010). Edmondson (1999) defined team learning as "an ongoing process of reflection and action, characterized by asking questions, seeking feedback, experimenting, reflecting on results, and discussing errors or unexpected outcomes of actions" (Edmondson, 1999, p. 353). There has also been an enormous increase in teamwork in companies and organizations. In the organizational literature, van Offenbeek (2001) stated, based on the model of Huber (Huber, 1991), that team learning includes the processes of information acquisition (i.e., learning actions whereby team members obtain information), information distribution (i.e., when team members share their gathered information with other team members), information interpretation (i.e., the dialogue or discussion in which the entire group interprets shared information, incorporating convergent thinking, which leads to collective interpretations), and information storage and retrieval (i.e., the storage of common information for future use of the team and the process of locating and using stored information). Decuyper et al. (2010) noted that studies use different labels (e.g., learning in teams, team learning, or group learning) that might cover the same underlying concept. Distinctions between the different labels are not sustainable in all educational contexts. Therefore, the clear operationalization of the characteristics of team learning in the current study's setting include:

- small group collaboration;
- student-initiated learning;
- students as the main source of information;
- commitment being required; and
- stable, small groups that work together in a long-term relationship.

The emphasis on team learning is also manifested in the accounting context. Both the educational field and professional bodies call for team learning. According to international educational standards, the teaching method used in an accounting setting should "encourage students to be active participants in the learning process" (International Federation of Accountants, 2008, p. 26). Teamwork is a key tenet in many accounting educational programs because of the generic lifelong skills that develop when working in teams, the learning benefits that accrue from teamwork, and employers' increasing recognition of the importance of employees' ability to work effectively in teams (Gibbs, Jenkins, & Ruse, 1994).

Although cooperative learning has been studied in many other domains, research in the area of accounting began to develop only at the end of the 20th century (Hosal-Akman & Simga-Mugan, 2010). Previous research on the benefits of cooperative learning—team learning in particular—has been conducted in accounting contexts at universities. Most research has reported on cooperative learning's effects on student achievement. Some scholars (e.g. Ciccotello & D'Amico, 1997; Hwang, Lui, & Tong, 2008) demonstrated that students in a cooperative learning section performed substantially better than students in a lecture-based learning section. Other studies (e.g. Gabbin & Wood, 2008; Lancaster & Strand, 2001) reported little or no improvement in students' performance when they worked in groups rather than working individually. Although this line of research could be useful to teachers and students concerned about monitoring the causes of academic success and failure, the accounting educational literature has no unequivocal answers regarding the efficacy of team learning.Therefore, this study also investigates the link between the preference for team learning and its effectiveness. Thus, the following hypothesis will also guide the current study:

Hypothesis 2: Team learning has a positive influence on the performance of students who select team learning compared with those who select lecture-based learning.

Method

Design and treatment

The current study was designed as a quasi-experiment. As shown in figure 1, an untreated control group design with a pre-test and a post-test (Cook & Campbell, 1979) was administered. To provide an answer to the growing diversity in student population, two learning paths were provided for the tutorials of an advanced accounting course: team learning and lecture-based learning. Students made a choice between team or lecture-based learning, and each student was allowed to attend the learning path of his/her choice for the entire semester. Furthermore, when selecting team learning, students selected their teammates, for a maximum of five team members. Although students were familiar with lecture-based learning from the previous semester, team learning was added as a new learning path.

Insert Figure 1

All students received both lectures and tutorial sessions for the advanced accounting course. The course content, consisting of the syllabus, the textbook, the assignments of the tutorials, and the final exam, was identical for both groups. The treatment, as shown in Table 2, was based on the five basic elements proposed by Johnson and Johnson (1989).

Insert Table 2

In the *control group* (i.e., lecture-based learning), the students decided whether to prepare their exercises at home before attending the tutorials. During the tutorials, the instructor presented the solution key while the students observed. The format was primarily lecture based, with limited interaction between the students and the teacher. There was no registration of class attendance (which is the normal procedure at this university), and the full solution key was posted on the Blackboard online system after each class. Although students

were passive observers, students were satisfied with this format because the answer key was presented stepwise.

In contrast, in the team-learning condition, all team members were required to prepare the exercises before class. During the tutorials, they sat together in their small teams and discussed the individual solutions to come to a group solution. Only when all of the members of the team came prepared to the tutorials a real discussion and a converging interpretation of the conclusions could take place within the team. Hence, *positive interdependence* of students within the team was built in. Furthermore, a team card that structured the discussion was implemented, following Klein and Doran (1999), who found that interdependence created by providing roles or structured guidelines has beneficial effects on achievement. Each team learner was required to be the team leader every fifth week. The team leader had to complete the team card, providing information on the attendance and individual preparation of the team members. By registering and discussing the individual preparation of the students, it became clear how much effort each student put into the assignment (*individual accountability*). In addition, the team leader provided guidance and monitored the group process during the tutorial (*social skills)*. The team learners were expected to ask questions, give feedback, reflect on the different solutions, and discuss errors and unexpected outcomes (engagement in *promotive face-to-face interaction)*. At the end of the session, a few minutes was allotted for evaluating the team process. The team members had to evaluate the progress made as a group and provide the group with a score for the group process, which was also written on the team card (*group process*).

In addition, the instructor's role was quite different in the team and lecture-based learning conditions. In the lecture-based learning condition, the instructor served as the primary and only source of information. In contrast, in the team-learning condition, the instructor set the learning tasks, monitored the functioning of the teams, and provided

feedback when necessary. The major resources for learning were the students' teammates rather than the instructor.

Procedures

The students were introduced to both learning paths in the last week of the first semester. During the orientation session, students received handouts explaining the content and practical organization of both learning paths. In the beginning of the second semester, this information was repeated, so that students were able to make an informed choice. Then, students formally subscribed to one of the two approaches. After the choice was made, the pre-test survey was administered during official class time. The teacher was present during the administration of the instrument but did not intervene in the data-gathering process. The students entered only their student ID code but not their name. They were assured that neither the teacher nor the school administration would have access to the data and that all personal information would be strictly confidential. At the final class of the semester, the post-test was administered using the same approach. This questionnaire was administered before the final exam took place.

Participants

This study was undertaken in a first-year undergraduate class in accounting at a large Belgian university during 2008 to 2009. In Belgium, higher education is completely publicly financed with negligible tuition fees in comparison with higher education in the U.S. [1]

Additionally, access to higher education is open in Belgium, and there are no formal selection procedures; a secondary education diploma is sufficient to gain entrance into a university (Duchesne & Nonneman, 1998). As a result of these lenient policies, a high percentage (25%) of students must repeat their entire first undergraduate year. These students were omitted in the present study because the focus of the study was on freshman students.

Freshman students were considered those entering the first year for the first time. Consequently, only the new generation of students was included, and all of the students were enrolled for the complete curriculum. No international students were included in the current study.

Because accounting courses are taken by many graduate and undergraduate students and are integrated in many curricula of higher education studies, the purpose of this study was to investigate the preferences and the levels of achievement in these classes. Only freshman students who participated in first and second semester exams and were present in class for the pre-test questionnaire were included in the sample. This resulted in 291 students. Of the 291 students in the sample, 209 (72%) selected the lecture-based learning approach, and 82 (28%) opted for team learning.

Measurement scales

Gender and Ability. Gender was registered during the pre-test survey. Following Doran and Bouillon (1991), who indicated that grade-point average (GPA) is a good predictor of subsequent performance, we use GPA as a proxy for ability. However, there are two important considerations: we use the student's GPA for the first semester, i.e., the ability before the experiment took place, and we excluded the accounting grade of the first semester course from the GPA. Thus, the 'GPA semester 1 excluding accounting' (GPA1W, mark on 440) was calculated as the GPA for all first-year first-semester undergraduate courses without including the score for accounting. Therefore, this study accounted for students' ability before the initiation of the experiment.

Performance. Academic performance was measured in three ways: a pre-test, a post-test, and a delta measure. For the first measure, we collected the exam score for the introductory accounting course in the first semester (Intro, mark on 40). Second, after the intervention, the grades obtained on the advanced accounting (Adva, mark on 40) exam were

used. The exam was composed of four comprehensive exercises—namely, journal entries, T-accounts, balance sheet, and income statement—which were similar to the exercises of the tutorial sessions. Third, performance was measured as the difference between Intro and Adva (Delta Intro-Adva). Most students earned a higher score on the Intro because it is an introduction to accounting course that generally includes content that is easier to learn. As a result, the delta has a positive sign for most students.

Performance in other courses. To control for a possible general increase in the effort of the students in the second semester, we also calculated the GPA for the second semester without including the grade for the Advanced accounting course (GPA2W, mark on 480).

Most constructs of the study were measured using a questionnaire composed of scales based on validated questionnaires. Motivation and learning strategy were measured in the pre-test survey, using a self-reported instrument on a 7-point Likert-type scale, which is an adequate approach for obtaining valid data because students have knowledge about their own learning (Gonyea, 2005). In a previous year, a pilot study was conducted by first-year undergraduate students (N= 405) to evaluate the instrument. Students were asked whether each item was clearly stated. Based on this pilot study, a few statements were deleted, while others were reformulated.

The current study used the Motivated Strategies for Learning Questionnaire (MSLQ) of Pintrich et al. (1991) to assesses college students' self-reported motivation orientation and their learning strategy for a particular course (Duncan & McKeachie, 2005). This scale has been successfully used in the past (Schunk, 2005). The back-translation method was applied to confirm accuracy. The questionnaire is translated into the target language by one translator and then translated back into the source language by an independent translator who is blinded to the original questionnaire. The two source-language versions are then compared (McGorry, 2000) and if necessary adapted or rephrased.

The *motivational scales* of the MSLQ are based on a broad social-cognitive model of motivation that consists of three constructs: value, expectancy, and affect. First, the *value* components focus on the reasons that students engage in academic tasks. The value scales are based on both achievement goal theory and expectancy value theory. The MSLQ includes three subscales to measure value beliefs: intrinsic goal orientation (focus on learning), extrinsic goal orientation (focus on grades and approval from others), and task value beliefs (judgments regarding how interesting, useful, and important course content is to the student). *Expectancy* components refer to students' belief that they can accomplish a task and include both *control of learning beliefs* and *self-efficacy for learning and performance*. The third general motivational construct is *affect*, which has been operationalized based on the responses to the *test anxiety* scale, which taps into students' concerns about taking exams.

To the authors' knowledge, the MSLQ has not been previously used with first-year students in accounting; therefore, all items are presented in Table 3. The Cronbach's alpha cannot be further improved by deleting items; it ranges between .60 to .93, which is in line with previous research (Pintrich et al. 1991). An exploratory factor analysis (principal component analysis) with varimax rotation was performed. *Task value* and *intrinsic goal orientation* were loading on the same factor, and therefore they were combined into one scale. Scale scores were computed as the mean of the items, as shown in Table 3.

Insert Table 3

Learning strategies. The *learning strategy section* of the MSLQ consisted of three components: 18 items concerning students' use of different *cognitive learning strategies, 12 items concerning metacognitive* learning *strategies* and 12 items concerning students' management of different resources. The first scale is based on a general cognitive model of learning and information processing. Cognitive learning strategies involve rehearsal, elaboration (ability to expand prior knowledge in detail), organization and critical thinking.

The second category is metacognitive self-regulation (ability to control one's cognitive processes). Students' *management of different resources* was measured through time/study environmental management and effort regulation. Finally, the MSLQ has a scale for peer learning and seeking help. Peer learning measures how effective an individual student is in using peers as a resource for learning. Help seeking measures the student's intention to seek help from the instructors and other staff. The Cronbach's alphas for the nine subscales ranged from .43 to .77. As shown in Table 4, some of the original items were deleted to improve internal consistency, although the Cronbach's alpha stays low for rehearsal. Scale scores were computed in a similar manner as the motivation scales and are listed in Table 4.

Insert Table 4

Results

Table 5 summarizes the descriptive statistics for all variables. The mean scores on the motivation and learning strategy scales ranged from 3.83 to 5.60, with corresponding standard deviations between .65 and 1.16. The exam score was on average lower for Adva (mean = 17.85) than for Intro (mean = 18.92), resulting in a positive mean for Delta Intro-Adva of 1.07.

Insert Table 5

The zero-order correlations (see Table 6) between the different scales suggest that they are fairly robust and valid. Not surprisingly, the two GPA measures were highly correlated with each other (r = .866, p = .000). Similar, the performance measure Adva was also highly correlated with Intro (r = .692, p = .000), GPA1W (r = .763, p = .000) and GPA2W (r = .771, p = .000). Furthermore, *in terms of the motivation subscales*, intrinsic goal orientation was significantly positively correlated with Intro, as well as with Adva. Note that extrinsic goal orientation was significant but negatively correlated with GPA1W, Intro, and Adva. This was

expected because students knew their score for the courses of the first semester at the time of the pre-test. Hence, students with a low grade on Intro (or a low GPA1W) were highly motivated to obtain a good grade for the Adva course and hence received a high score on extrinsic goal orientation. Finally, in terms of *learning strategies*, GPA1W was significantly positively correlated with elaboration (r = .283, p = .000), critical thinking (r = .195, p = .000), metacognitive self-regulation (r = .212, p = .000), time/study environment management (r = .323, p = .000), and effort regulation (r = .395, p = .000). Similar positive relationships were found between learning strategies and the grade on the accounting course, for both the Intro and Adva. Students who elaborate on the course material, pose critical questions when studying, focus on things they do not fully understand, make good use of their study time, and continue studying even the uninteresting parts apparently receive a higher grade on the exams. Note that performance in terms of Intro, Adva, or GPA1W was *not* significantly correlated with rehearsal and organization. Hence, memorizing a list of key concepts and being well organized seem not to result in higher grades (Intro, Adva, or GPA1W).

Insert Table 6

To address H1a, the differences in student characteristics between the two learning conditions were analyzed. The first step was a chi-squared test for *gender* by learning path. The choice pattern differed significantly by gender (X^2 = 11.47, p = .001), as shown in Table 7. Approximately 62% of the team learning students were female students, whereas only 38% of the team learning students were male students, supporting the first hypothesis (H 1a). Therefore, gender should be considered when interpreting the results.

Insert Table 7

Concerning *ability*, significant differences emerged between the learning groups prior to the manipulation (Table 5). The performance measures GPA1W (t = 2.43, p =.016) and Intro (t = 1.99, p =.047) were significantly higher for the students who opted for lecture-based

learning, implying that lower-ability students preferred the team-learning approach, supporting hypothesis 1b.

As shown in Table 5, students differed in terms of *motivation and learning strategy*. However, from the correlation table (Table 6), we know that ability was correlated with (most of) the learning strategy subscales and some of the motivation scales. From the previous paragraphs, we know that there are significant differences between the two conditions in terms of ability and gender mix. Therefore, ANCOVAs were used to examine the differences in terms of students' motivation and learning strategies while controlling for GPA1W and gender (see Table 8). The results indicate that team learners reported a higher intrinsic motivation and task value ($F = 6.19$, $p = .000$). In addition, lecture-based learners reported a significantly higher control of learning beliefs ($F = 11.89$, $p = .001$). As a result, hypothesis 1c was supported.

No significant differences were found in the learning strategy scales for the ANCOVAs except for peer learning and help seeking. Not surprisingly, team learners attached higher importance to peer learning ($F = 8.09$, $p = .005$), and team learners reported significantly higher help seeking ($F = 9.19$, $p = .003$), which supports hypothesis 1d.

Insert Table 8

To address the second hypothesis, a one-way analysis of variance (ANOVA) was used to analyze the performance differences between the two groups at the pre-test and post-test. As described above (Table 5), the ANOVA revealed a significant main effect of learning path on Intro ($F = 3.98$, $p = .047$) but no significant effect on Adva ($F = .65$, $p = .421$) or Delta Intro-Adva ($F = 2.04$, $p = .154$). This suggests again that students with a lower grade for the Intro preferred the team-learning approach.

Again, because we know that both gender and ability are correlated with performance, an ANCOVA was used to investigate whether performance differed between team learning

and lecture-based learning while controlling for GPA1W and gender. As shown in Table 8, the learning path was not significant for Intro (p = .347) and was not significant for Adva (p = .117). In contrast, the ANCOVA with Delta Intro-Adva as the dependent variable, GPA1W and gender as covariates, and the learning path as the independent variable reveals a significant result ($F = 5.28$, $p = .022$). The difference between the scores on the introductory and advanced accounting courses is significantly lower for team learners (estimated marginal mean = -.48) compared with lecture-based learners (estimated marginal mean = 1.68). In other words, the gap between the scores for Intro and Adva is greater for the lecture-based learners than for the team learners. As shown in figure 2, the team learners started at a lower performance level but outperformed the lecture-based learners at the end of the experiment (while controlling for the gender and ability differences).

Insert Figure 2

An ANCOVA with the GPA of the second-semester courses (without the results of the advanced accounting course) as a dependent variable and gender and GPA1W as covariates revealed no significant results ($F = .01$, $p = .940$). It appears that students of the two learning paths obtained equal scores for the GPA of the second semester, minus the grade for the advanced accounting course. Hence, the students who selected team learning did not show significant improvement for the other courses in that second semester. Therefore, we can conclude that the selected team-learning approach was helpful in increasing students' learning of accounting.

Discussion

The results of the present study build on findings from earlier research on team learning, learning preferences, and their relationship to academic performance. Two learning

paths were offered to freshman accounting students: team learning and lecture-based learning. Students could opt for one of the two learning paths for the tutorials of an advanced accounting course. The selection was fixed for the entire semester, involving 12 weeks of class. The results indicate that the students selecting the team-learning path have a specific profile that varies in several domains from that of the lecture-based learners.

First, female students had a higher preference for team learning than did male students, supporting the results of Johnson and Engelhard (1992), who studied the learning preferences of African-American adolescents. Anderson and Adams (1992) also found a differential preference for cooperative learning techniques between men and women. They based their argument on the fact that women's learning style emphasizes connected knowing, cooperative problem solving, and socially based knowledge. Woman prefer cooperative learning techniques because this pedagogy matches their learning style, and men prefer traditional lecture techniques, given their more analytical, individualistic, and competitive learning style. In addition, the correlation Table shows that gender is correlated with learning strategy and motivation but not with ability or performance.

Second, the groups differed significantly on ability. Students preferring team learning obtained a lower score in the introductory accounting course in the previous semester, suggesting that the brighter students were more likely to select lecture-based learning. The lower results for the introductory course may have stimulated low achievers to alter their learning method. Similarly, Engelhard and Monsaas (1989) found that academic achievement is related to learning preferences, with more successful students reporting a higher preference for competition (e.g., lecture-based learning), whereas less successful students report a higher preference for cooperation. Love, Love, and Northcraft (2010) concluded that negative goal discrepancies are likely to lead to increased efforts, as students attempt to increase their performance to achieve the goal of passing the course. In this respect, it seems that students in

the current study who failed during the introductory course suffered from negative goal discrepancies. Based on the theory of Love et al. (2010), these students increased their commitment and opted for team learning in the second-semester course.

Third, the groups also differed in terms of self-efficacy and control of learning beliefs. The students who preferred the lecture-based approach scored significantly higher on the pre-test in terms of self-efficacy and control of learning beliefs than did the students who preferred team learning. After controlling for gender and ability, the differences in terms of control of learning beliefs remained. Hence, students opting for team learning were more uncertain whether the final grade was contingent on their individual efforts. They were afraid that they would not be able to understand the material by themselves and therefore selected team learning.

Fourth, students selecting team learning reported more intrinsic motivation and attached a higher importance to task value. Team-learning students reported being more intrinsically interested in accounting and eager to study the course material. Hence, offering a choice between the two learning paths provides a way of selecting the most motivated students and for the university to invest only additional resources in these efforts.

Fifth, it must be noted that the team-learning and lecture-based learning students seem to have the same learning strategies. These two groups are consequently comparable in terms of their approach to learning. However, the correlations reveal that high ability and high performance for both accounting courses are linked to a good learning strategy (elaboration, critical thinking, self-regulation, effort regulation, and management of the time/study environment). This relationship was not found for rehearsal (probably because of its low Cronbach's Alpha) and organization.

Sixth, not surprisingly, team learners reported significantly higher peer learning and help seeking compared with the lecture-based learners. This could be one reason that those

students chose team learning. It is possible that these students have a greater need for support and guidance, which are available in the team-learning environment.

Seventh, unlike previous studies, this quasi-experiment was organized over the entire semester, making it possible to show results based on students' experiences throughout the semester. This specific form of active learning demonstrated positive educational outcomes for students who opted for team learning. The design made it possible to compare pre- with post-performance without interim performance measures (e.g., mid-term exams). The results indicated that the team-learning approach was helpful for increasing academic performance, which was measured at the end of the second semester. The major question posed was whether team learning benefited the lower ability students. The team learners had a significantly lower score for the introductory course, but they managed to overcome this difference on the advanced course. In other words, team-learning students caught up with the lecture-based learning students in performance after the team-learning intervention. The ANCOVA analyses supported this finding with a significant effect of team learning on Delta Intro-Adva. The difference between the introductory and advanced scores was higher for the lecture-based learners, indicating that the score at the advanced test decreased more for lecture-based students than for team learners. This result highlights the fact that—despite their low general ability—the team-learning students scored equally as well on the advanced accounting test as did the lecture-based learning students. Thus, team learning appears to be an efficient learning method for first-year undergraduates. This conclusion is in line with the previous literature, which found that small groups facilitate academic learning (Johnson & Johnson, 1989; Slavin, 1991; Vasquez, Johnson, & Johnson, 1993). To understand why team learning had worked for these students, answers probably lie in the social interaction process (Lundeberg & Moch, 1995). In Vygotsky's view, modeling and speaking precede learning and thinking. Social interaction enhances thinking because students can learn to solve tasks

independently by first tackling tasks together with peers in the team (Lundeberg & Moch, 1995). The scaffolding process occurs when less skillful students actively cooperate with more competent peers and thereby enable the lower ability students to develop more complex levels of understanding and skills by providing them feedback (Onwuegbuzie & DaRos-Voseles, 2001). The scaffolding process could also provide an explanation. Although the majority of the students who preferred team learning were low-ability students, there were also high-ability students involved in the team-learning process.

Limitations and future research

It is important to note that the current study has certain limitations. First, the study implemented only two learning paths. It this way we can make a clear distinction between lecture-based and team-based learning. Nevertheless, it would be interesting and challenging to compare student preferences and achievement if more learning paths were implemented. Second, this study was limited to first-year undergraduate students in one institution. As a result, we must be cautious in suggesting generalizability of the results. Although team learning was implemented in three successive cohorts of students, we collected quantitative data for only one year. To enhance insights into potential cultural differences, it would be interesting to implement these different paths in several universities. Therefore, we invite colleagues to implement team learning at their institutions to replicate our findings and to stimulate the discussion on organizing student learning for large classes in an active, student-friendly, and cost-effective way.

In addition to these possibilities for future research which result from the paper's limitations, the results also lead to some suggestions for future research. The innovativeness of this research is that the students themselves stipulated their learning path. Future research might focus on students who were originally interested in the team-learning approach but who

subsequently were not willing to put effort into discussing the material with their teammates. Furthermore, this study provides insights into the profiles of first-year accounting students who selected team or lecture-based learning. The results suggest that elements under the instructor's control, such as the choice of team learning as an education method, have the potential to influence students' academic performance positively, especially for students who start with a lower ability and are willing to engage in team learning. It would also be interesting to explore the student satisfaction and student perceptions. In addition, the results clarified that a specific group of students preferred team learning. These students are more intrinsically motivated and are willing to share their knowledge with peers and with the instructor. No differences were found in terms of learning strategy. Further research could focus on other personal characteristics such as self-efficacy or consciousness. Finally, the current study has contributed to the research on predictors of performance by investigating the relationship among several variables that accounted for the variance in examination grades. The mean findings indicate that some students may have a greater need for support and guidance and that students prefer different learning paths. Future research on predictors of academic achievement and academic preferences could consider these findings.

Endnotes:

[1] For more information about Higher education in Belgium, see Duchesne and Nonneman (1998)

References

Anderson, J. A., & Adams, M. (1992). Acknowledging the learning styles of diverse student populations: Implications for instructional design. *New directions for teaching and learning, 1992*(49), 19-33.

August, L., Hurtado, S., Wimsatt, L. A., & Dey, E. L. (2002). *Learning styles: Student preferences vs. faculty perceptions.* Paper presented at the Annual Forum for the Association for Institutional Research Toronto, Cananda.

Bonwell, C. C., & Eison, J. A. (1991). *Active learning: Creating excitement in the classroom*: School of Education and Human Development, George Washington University Washington, DC.

Braxton, J. M., Milem, J. F., & Sullivan, A. S. (2000). The influence of active learning on the college student departure process: Toward a revision of Tinto's theory. *Journal of Higher Education, 71*, 569-590.

Cabrera, A. F., Nora, A., Crissman, J. L., Terenzini, P. T., Bernal, E. M., & Pascarella, E. T. (2002). Collaborative learning: Its impact on college students' development and diversity. *Journal of College Student Development, 43*(1), 20-34.

Chang, C. Y., & Tsai, C. C. (2005). The interplay between different forms of CAI and students' preferences of learning environment in the secondary science class. *Science Education, 89*(5), 707-724.

Ciccotello, C., & D'Amico, R. (1997). An empirical examination of cooperative learning and student performance in managerial accounting. *Accounting Education: A Journal of Theory, Practice and Research, 2*(1), 1-8.

Cook, T., & Campbell, D. (1979). *Quasi-experimentation: Design & analysis issues for field settings*. Boston MA Houghton Mifflin.

Decuyper, S., Dochy, F., & Van den Bossche, P. (2010). Grasping the dynamic complexity of team learning: An integrative model for effective team learning in organisations. *Educational Research Review, 5*(2), 111-133.

Doran, B. M., Bouillon, M. L., & Smith, C. G. (1991). Determinants of Student Performance in Accounting Principles I and II. *Issues in Accounting Education, 6*(1), 74-84.

Duchesne, I., & Nonneman, W. (1998). The demand for higher education in Belgium. *Economics of Education Review*, 17(2), 211-218.

Duncan, T. G., & McKeachie, W. (2005). The making of the motivated strategies for learning questionnaire. *Educational psychologist, 40*(2), 117 - 128.

Edmondson, A. (1999). Psychological Safety and Learning Behavior in Work Teams. *Administrative Science Quarterly, 44*(2), 350-383.

Engelhard, G., & Monsaas, J. A. (1989). Academic performance, gender, and the cooperative attitudes of third, fifth, and seventh graders. *Journal of Research & Development in Education, 22*(2), 13-17.

Entwistle, N., McCune, V., & Hounsell, J. (2002). Approaches to studying and perceptions of university teaching-learning environments: Concepts, measures and preliminary findings. *Enhancing Teaching and Learning Environments in Undergraduate Courses Occasional Report, 1*.

Gabbin, A., & Wood, L. (2008). An Experimental Study of Accounting Majors' Academic Achievement Using Cooperative Learning Groups. *Issues in Accounting Education, 23*(3), 391-404.

Gibbs, G., Jenkins, A., & Ruse, C. (1994). *Developing students' transferable skills* Oxford: The Oxford Centre for Staff Development.

Gonyea, R. M. (2005). Self-reported data in institutional research: Review and recommendations. *New Directions for Institutional Research, 2005*(127), 73-89.

Hativa, N., & Birenbaum, M. (2000). Who prefers what? Disciplinary differences in students' preferred approaches to teaching and learning styles. *Research in Higher Education, 41*(2), 209-236.

Hosal-Akman, N., & Simga-Mugan, C. (2010). An assessment of the effects of teaching methods on academic performance of students in accounting courses. *Innovations in Education and Teaching International, 47*(3), 251-260.

Huber, G. P. (1991). Organizational Learning: The Contributing Processes and the Literatures. *Organization Science, 2*(1), 88-115.

Hwang, N. C. R., Lui, G., & Tong, M. Y. J. W. (2008). Cooperative Learning in a Passive Learning Environment: A Replication and Extension. *Issues in Accounting Education, 23*(1), 67-75.

Ickes, W., & Conzales, R. (1994). " Social" Cognition and Social Cognition: From the Subjective to the Intersubjective. *Small Group Research, 25*(2), 294-315.

International Federation of Accountants. (2008). *International Accounting Education Standards Board: International Education Standards 1-8*. New York: International Federation of Accountants.

Johnson, C., & Engelhard, J. G. (1992). Gender, academic achievement, and preferences for cooperative, competitive, and individualistic learning among African-American adolescents. *Journal of Psychology, 126*(4), 385-392.

Johnson, D., Johnson, R., & Smith, K. (2007). The State of Cooperative Learning in Postsecondary and Professional Settings. *Educational Psychology Review, 19*(1), 15-29.

Johnson, D. W., & Johnson, R. T. (1989). *Cooperation and competition: Theory and research*. Edina, MN, US: Interaction Book Company.

Kelly, P., Haidet, P., Schneider, V., Searle, N., Seidel, C. L., & Richards, B. F. (2005). A Comparison of In-Class Learner Engagement Across Lecture, Problem-Based Learning,

and Team Learning Using the STROBE Classroom Observation Tool. *Teaching & Learning in Medicine, 17*(2), 112-118.

Kember, D. (2009). Promoting student-centred forms of learning across an entire university. *Higher Education,* 58(1), 1-13.

Klein, J., & Doran, M. (1999). Implementing individual and small group learning structures with a computer simulation. *Educational Technology, Research and Development, 47*(1), 97-110.

Lammers, W. J., & Murphy, J. J. (2002). A profile of teaching techniques used in the university classroom: a descriptive profile of a US public university. *Active Learning in Higher Education*, 3(1), 54 - 67.

Lancaster, K., & Strand, C. (2001). Using the Team-Learning Model in a Managerial Accounting Class: An Experiment in Cooperative Learning. *Issues in Accounting Education, 16*(4), 549-567.

Love, E. G., Love, D. W., & Northcraft, G. B. (2010). Is The End in Sight? Student Regulation of In-Class and Extra-Credit Effort in Response to Performance Feedback. *Academy of Management Learning & Education, 9*(1), 81-97.

Lundeberg, M. A., & Moch, S. D. (1995). Influence of social interaction on cognition: Connected learning in science. *The Journal of Higher Education, 66*(3), 312-335.

Matveev, A. V., & Milter, R. G. (2010). An implementation of active learning: Assessing the effectiveness of the team infomercial assignment. *Innovations in Education and Teaching International, 47*(2), 201-213.

McGorry, S. Y. (2000). Measurement in a cross-cultural environment: survey translation issues. *Qualitative Market Research: An International Journal, 3*(2), 74-81.

Onwuegbuzie, A. J., & DaRos-Voseles, D. A. (2001). The role of cooperative learning in research methodology courses: A mixed-methods analysis. *Research in the Schools, 8*(1), 61-75.

Pintrich, P., Smith, D., Garcia, T., & McKeachie, W. (1991). A manual for the use of the Motivated Strategies for Learning Questionnaire (MSLQ). *Educational Psychological Measurement, 53*, 801 - 813.

Postareff, L., Lindblom-Ylänne, S., & Nevgi, A. (2008). A follow-up study of the effect of pedagogical training on teaching in higher education. *Higher Education, 56*(1), 29-43.

Sand-Jecklin, K. (2007). The impact of active/cooperative instruction on beginning nursing student learning strategy preference. *Nurse Education Today, 27*(5), 474-480.

Schoenecker, T. S., Martell, K. D., & Michlitsch, J. F. (1997). Diversity, performance, and satisfaction in student group projects: An empirical study. *Research in Higher Education, 38*(4), 479-495.

Schunk, D. (2005). Commentary on self-regulation in school contexts. *Learning and Instruction, 15*(2), 173-177.

Shankar, P., & Seow, J. L. (2007). *Accounting student perceptions, preferences and performance outcomes in team projects*. Paper presented at the Asia-Pacific Interdisciplinary Research in Accounting (APIRA 2007).

Slavin, R. E. (1990). *Cooperative Learning: Theory, Research and Practice*. Englewood Cliffs: N.J.: Prentice-hall.

Slavin, R. E. (1991). Synthesis of Research on Cooperative Learning. *Educational Leadership, 48*(5), 71-82.

Sonnenwald, D. H., & Li, B. (2003). Scientific collaboratories in higher education: Exploring learning style preferences and perceptions of technology. *British Journal of Educational Technology, 34*(4), 419-431.

Tinto, V. (1997). Classrooms as communities: Exploring the educational character of student persistence. *Journal of Higher Education*, 599-623.

Trigwell, K., Prosser, M., & Waterhouse, F. (1999). Relations between teachers' approaches to teaching and students' approaches to learning. *Higher Education, 37*(1), 57-70.

Trow, M. (1999). From mass higher education to universal access: The American advantage. *Minerva, 37*(4), 303-328.

Tsay, M., & Brady, M. (2010). A case study of cooperative learning and communication pedagogy: Does working in teams make a difference? *Journal of the Scholarship of Teaching and Learning, 10*(2), 78–89.

Tynjälä, P., Välimaa, J., & Sarja, A. (2003). Pedagogical perspectives on the relationships between higher education and working life. *Higher education, 46*(2), 147-166.

van Offenbeek, M. (2001). Processes and outcomes of team learning. *European Journal of Work & Organizational Psychology, 10*(3), 303-317.

Vasquez, B., Johnson, D. W., & Johnson, R. T. (1993). The impact of cooperative learning on the performance and retention of US Navy air traffic controller trainees. *The Journal of Social Psychology, 133*(6), 769-783.

Wierstra, R. F. A., Kanselaar, G., van der Linden, J. L., Lodewijks, H. G. L. C., & Vermunt, J. D. (2003). The impact of the university context on European students' learning approaches and learning environment preferences. *Higher education, 45*(4), 503.

Table 1: Basic elements of cooperation (Johnson & Johnson, 1989).

Basic element	Definition
Positive interdependence	Team members perceive that they need each other in order to complete the group's task. Students work together in small groups to maximize the learning of all members.
Individual accountability	Team members' performances are individually assessed. Group members hold individual members responsible for contributing his or her fair share to the team's success.
Social skills	Teams cannot function effectively if members do not have/use the needed social skills. Examples of these skills are leadership. communication. and decision-making.
Promotive face-to-face interaction	Team members promote each other's productivity by helping. sharing. encouraging. and facilitating each other's effort to complete tasks and achieve the goals.
Group processing	Teams need specific time to discuss how well they are achieving their goals and maintaining effective working relationships among members.

Table 2: Treatment

Basic element	Control Group: Lecture-based learning *N* = 209	Experimental Group: Team learning *N* = 82
Positive interdependence	Students listen to the instructor, who is presenting the solution in front of the class.	Students compare and discuss their solutions in small teams.
Individual accountability	Voluntary preparation at home.	Required preparation at home.
Social skills	No commitment to class attendance and no role to accept during class.	Commitment to team attendance in class and to accept the role of team leader every fifth week.
Promotive face-to-face interaction	Minor possibility to ask questions to peers and the instructor.	Possibility to ask questions to peers and the instructor.
Group processing	No report on the learning process	A team card to report on the learning process as a team

Table 3: Reliability measures for the MSLQ: Motivation subscales

	Measures and items *(1 I completely disagree – 7 I completely agree)*	Cronbach's alpha	Cronbach's alpha	Factor loading
Value				
Intrinsic goal orientation		.61	.84	
1	In a class like this. I prefer course material that challenges me so I can learn new things.	X	X	.58
2	I prefer course material that arouses my curiosity. even if it is difficult to learn.	X	X	.58
3	The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.	X	X	.53
4	I choose to prepare assignments at home even if I don't get credits for that. *	X	X	.45
Task value		.84		
1	I think I will be able to use what I learn in this course in other courses.	X	X	.55
2	It is important for me to learn the course material in this class.	X	X	.56
3	I am very interested in the content area of this course.	X	X	.77
4	I think the course material in this class is useful for me to learn.	X	X	.77
5	I like the subject matter of this course.	X	X	.78
6	Understanding the subject matter of this course is important to me.	X	X	.71
Extrinsic goal orientation		.45	.60	
1	Getting a good grade in this class is very important for me. *	X	X	.72
2	The most important thing for me right now is improving my overall grade point average. so my main concern in this class is getting a good grade.	X	X	.57
3	If I can. I want to get better grades in this class than I scored for the intro to accounting class. *	X		
4	I want to do well in this class because it is important to show my ability to my family and friends. *	X	X	.84

* Adapted after the pilotstudy

Expectancy			
Control of Learning Beliefs		.72	
1	If I study in appropriate ways. then I will be able to learn the material in this course.	X	.21
2	It is my own fault if I don't succeed for this course.*	X	.65
3	If I try hard enough. then I will understand the course material.	X	.39
4	If I don't understand the course material. it is because I didn't try hard enough.	X	.76
Self-Efficacy for Learning & Performance		.93	
1	I believe I will receive an excellent grade in this class.	X	.72
2	I'm certain I can understand the most difficult material presented in the readings for this course.	X	.75
3	I'm confident I can learn the basic concepts taught in this course.	X	.69
4	I'm confident I can understand the most complex material presented by the instructor in this course.	X	.83
5	I'm confident I can do an excellent job on the exam of this course.*	X	.76
6	I expect to do well in this class.	X	.78
7	I'm certain I can master the skills being taught in this class.	X	.82
8	Considering the difficulty of this course. the teacher. and my skills. I think I will do well in this class.	X	.81
Affect			
Test Anxiety		.77	
1	When I take a test I think about how poorly I am doing compared with other students.	X	.66
2	When I take a test I think about items on other parts of the test I can't answer.	X	.68
3	When I take tests I think of the consequences of failing.	X	.68
4	I have an uneasy. upset feeling when I take an exam.	X	.78
5	I feel my heart beating fast when I take an exam.	X	.71

* Adapted after the pilotstudy

Table 4: Reliability measures for the MSLQ: Learning Strategies subscales

Measures and items *(1 I completely disagree – 7 I completely agree)*		Cronbach's alpha	Cronbach's alpha	Factor loading
Cognitive learning strategies				
Rehearsal		.42	.43	
1	When I study for this class. I practice saying the material to myself over and over.	X		
2	When studying for this course. I read my class notes and the course readings over and over again.	X	X	.70
3	I memorize key words to remind me of important concepts in this class.	X	X	.40
4	I make lists of important items for this course and memorize the lists.	X	X	.23
Elaboration		.59	.62	
1	I try to relate ideas in this subject to those in other courses whenever possible.	X	X	.74
2	When reading for this class. I try to relate the material to what I already know.	X	X	.62
3	When I study for this course. I write brief summaries of the main ideas from the readings and my class notes.	X		
4	I try to understand the material in this class by making connections between the readings and the concepts from the lectures.	X		
5	I try to apply ideas from course readings in other class activities such as lecture and discussion.	X	X	.82
Organization		.74		
1	When I study for this course. I outline the material to help me organize my thoughts.	X		.79
2	When I study for this course. I go through the readings and my class notes and try to find the most important ideas.	X		.10
3	I make simple diagrams to help me organize course material. *	X		.78
4	When I study for this course. I go over my class notes and make an outline of important concepts.	X		.80
Critical thinking		.77		
1	I often find myself questioning things I hear or read in this course to decide if I find them convincing enough.	X		.78
2	When a theory. interpretation. or conclusion is introduced in class or in the readings. I try to decide if there is good supporting evidence.	X		.79
3	I treat the course material as a starting point and try to develop my own ideas about it.	X		.49
4	I try to play around with ideas of my own related to what I am learning in this course.	X		.49
5	Whenever I read or hear an assertion or conclusion in this class. I think about possible alternatives.	X		.49

* Adapted after the pilotstudy

Metacognitive learning strategy				
Metacognitive Self-regulation		.70	.71	
1	During class time. I often miss important points because I'm thinking of other things. (reverse scaled)	X		
2	When reading for this course. I make up questions to help focus my reading.	X	X	.73
3	When I become confused about something I'm reading for this class. I go back and try to figure it out.	X	X	.43
4	If course readings are difficult to understand. I change the way I study.*	X	X	.40
5	Before I study new course material thoroughly. I often skim it to see how it is organized.	X	X	.36
6	I ask myself questions to make sure I understand the material I have been studying in this class.	X	X	.75
7	I try to change the way I study in order to fit the course requirements and the instructor's teaching style.	X	X	.55
8	I often find that I have been reading for this class but don't know what it was all about. (reverse scaled)	X		
9	I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for this course.	X	X	.44
10	When studying for this course I try to determine which concepts I don't understand well.	X	X	.57
11	When I study for this class. I set goals for myself in order to direct my activities in each study period.	X	X	.16
12	If I get confused taking notes in class. I make sure I sort it out afterwards.	X	X	.34
Resource management				
Time/Study environmental Management		.65	.66	
1	I usually study in a place where I can concentrate on my course work.	X	X	.67
2	I make good use of my study time for this course.	X	X	.66
3	I find it hard to stick to a study schedule. (reverse scaled)	X	X	.52
4	I have a regular place set aside for studying.	X	X	.56
5	I make sure that I keep up with the weekly readings and assignments for this course.	X	X	
6	I attend class regularly.	X		
7	I often find that I don't spend very much time on this course because of other activities. * (reverse scaled)	X	X	.24
8	I find rarely time to study for my courses before the study periode starts.* (reverse scaled)	X	X	.23
Effort Regulation		.75		
1	I don’t like to study for this class and I quit before I finish what I planned to do. * (reverse scaled)	X		.52
2	I work hard to do well in this class even if I don't like what we are doing.	X		.58
3	When course work is difficult. I either give up or only study the easy parts. (reverse scaled)	X		.40
4	Even when course materials are dull and uninteresting. I manage to keep working until I finish.	X		.53

Measures and items		Cronbach's alpha	Cronbach's alpha	Factor loading
Peer learning(1 I completely disagree – 7 I completely agree)		.55		
1	When studying for this course. I often try to explain the material to a classmate or friend.	X		.59
2	I try to work with other students from this class to prepare the exercises.*	X		.22
3	When studying for this course. I often set aside time to discuss course material with a group of students from the class.	X		.45
Help seeking (1 I completely disagree – 7 I completely agree)		.72		
1	Even if I have trouble learning the material in this class. I try to do the work on my own. without help from anyone. (reverse scaled)	X		.55
2	I ask the instructor. the teaching assistant or the student counseling service to clarify concepts I don't understand well.*	X		.62
3	When I can't understand the material in this course. I ask another student in this class for help.	X		.78
4	I try to identify students in this class whom I can ask for help if necessary.	X		.75

* Adapted after the pilotstudy

Table 5: Descriptives

	N	min	*max*	Mean	SD	LBL		*TBL*		t	*p-value*
						N	Mean	*N*	Mean		
Motivation											
Intrinsic Goal Orientation & task value	291	1.90	6.30	4.86	0.83	209	4.75	82	5.14	-3.70	.000
Extrinsic Goal orientation	291	3.00	7.00	5.60	0.88	209	5.52	82	5.80	-2.45	.015
Control of Learning Beliefs	291	2.00	7.00	4.90	0.96	209	5.04	82	4.54	4.09	.000
Self-Efficacy for Learning & Performance	291	1.00	7.00	4.25	0.94	209	4.35	82	4.02	2.71	.007
Test Anxiety	291	2.00	6.60	4.27	0.94	209	4.21	82	4.43	-1.84	.067
Learning strategy											
Rehearsal	291	2.00	7.00	4.60	1.05	209	4.56	82	4.69	-1.16	.248
Elaboration	291	1.75	6.50	4.76	0.84	209	4.79	82	4.67	1.08	.283
Organization	291	1.00	7.00	4.55	1.14	209	4.48	82	4.71	-1.55	.122
Critical Thinking	291	1.00	6.20	3.83	0.93	209	3.84	82	3.80	0.39	.696
Metacognitive Self-Regulation	291	2.70	6.10	4.62	0.67	209	4.62	82	4.63	-0.19	.849
Time/Study Environmental Management	291	1.83	6.67	4.72	0.87	209	4.76	82	4.61	1.29	.198
Effort regulation	291	1.25	7.00	4.76	1.05	209	4.78	82	4.69	0.68	.496
Peer learning	291	1.00	6.75	3.85	1.15	209	3.72	82	4.20	-3.29	.001
Help seeking	291	1.75	6.50	4.24	0.89	209	4.12	82	4.53	-3.60	.000
Ability [a]											
GPA1W (mark on 440)	291	49.00	377.00	240.10	64.74	209	245.83	82	225.50	2.43	.016
Performance [a]											
Intro (mark on 40)	291	2.00	38.00	18.92	8.92	209	19.57	82	17.27	1.99	.047
Adva (mark on 40)	291	0.00	40.00	17.85	9.30	209	18.13	82	17.15	0.81	.421
Delta Intro–Adva	291	-20.50	16.00	1.07	7.16	209	1.44	82	0.12	1.43	.154
GPA2W (mark on 480)	291	80.00	427.00	266.46	75.45	209	272.66	82	250.67	2.25	.025

LBL = Lecture-based learning. TL = Team learning
[a]This information is obtained from administrative records

Table 6: Correlations

		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
1	Intrinsic Goal Orientation & Task Value	1																			
2	Extrinsic Goal Orientation	.320**	1																		
3	Control Beliefs	.222**	.025	1																	
4	Self-Efficacy for learning and performance	.444**	.001	.578**	1																
5	Test Anxiety	.132*	.283**	-.096	-.193**	1															
6	Rehearsal	.228**	.248**	-.011	.023	.216**	1														
7	Elaboration	.208**	.017**	.105	.157**	.061	.191**	1													
8	Organization	.235**	.151	.010	.013	.154**	.455**	.290**	1												
9	Critical Thinking	.167**	.019	.184**	.210**	.020	.007	.445**	.072	1											
10	Metacognitive Self-regulation	.346**	.053	.095	.218**	.103	.299**	.515**	.341**	.402**	1										
11	Time and Study Environment	.300**	.019	.043	.329**	-.024	.263**	.246**	.165**	.067	.340**	1									
12	Effort Regulation	.316**	-.071	-.018	.315**	-.055	.290**	.260**	.162**	.053	.438**	.625**	1								
13	Peer learing	.270**	.127*	-.133*	.048	.135*	.202**	.255**	.267**	.105	.274**	.196**	.197**	1							
14	Help Seeking	.325**	.194**	-.057	.125*	.196**	.296**	.264**	.320**	.115	.344**	.213**	.250**	.765**	1						
15	GPA1W	-.022	-.343**	-.037	.180**	-.092	-.075	.283**	-.047	.195**	.212**	.323**	.395**	.050	.029	1					
16	Intro	.146*	-.430**	.041	.264**	-.104	-.083	.179**	-.033	.115	.115*	.236**	.318**	.081	.061	.628**	1				
17	Adva	.155**	-.379**	-.001	.253**	-.193**	-.119*	.190**	-.075	.128*	.122*	.259**	.359**	.096	.075	.763**	.692**	1			
18	Delta Intro-Adva	-.019	-.043	.052	.000	.121*	.051	-.024	.056	-.024	-.015	-.043	-.070	-.023	-.022	-.208**	.347**	-.437**	1		
19	GPA2W	.008	-.359**	.040	.211**	-.108	-.065	.219**	-.031	.176**	.206**	.295**	.373**	.053	.052	.866**	.634**	.771**	-.213**	1	
20	Gender	.164**	.056	-.258**	-.192**	.160**	.245**	.082	.247**	-.196**	.128*	.051	.189**	.196**	.221**	.050	.100	.051	.057	-.010	1

**Correlation is significant at the 0.01 level (2-tailed)

*Correlation is significant at the 0.05 level (2-tailed)

Table 7*:* Crosstab gender and learning path

		Lecture-based learning	Team learning	Total
Male	*N* =	125	31	156
	% of total	59.8%	37.8%	53.6%
Female	*N* =	84	51	135
	% of total	40.2%	62.2%	46.4%
Total	*N* =	209	82	
	% of total	71.8%	28.2%	

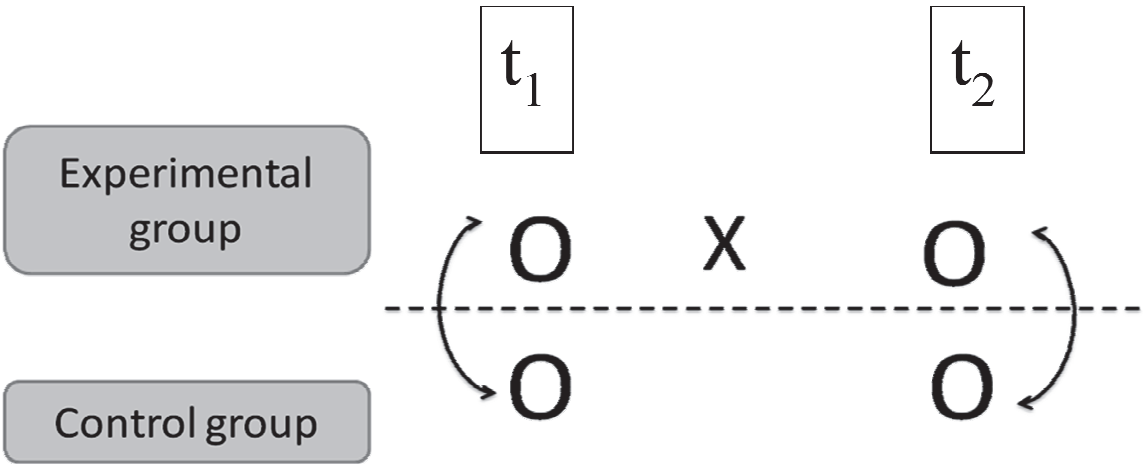
*Pearson chi-square = 11.47 ; p = .001

Table 8: Ancova's on MSLQ and performance

Dependent variable	Estimated marginal mean$_{LBL}$	Estimated marginal mean$_{TL}$	*F*	*p*
Panel A : MSLQ (covariate: gender and GPA1W)				
Motivation				
Intrinsic Goal Orientation & task value	4.76	5.11	6.19	.002
Extrinsic Goal orientation	5.55	5.72	2.18	.141
Control of Learning Beliefs	5.02	4.59	11.89	.001
Self-Efficacy for Learning & Performance	4.31	4.11	2.72	.100
Test Anxiety	4.24	4.37	1.17	.281
Learning strategy				
Rehearsal	4.59	4.61	.012	.913
Elaboration	4.78	4.71	.46	.497
Organization	4.52	4.61	.36	.551
Critical Thinking	3.80	3.90	.74	.391
Metacognitive Self-Regulation	4.61	4.64	.09	.762
Time/Study Environmental Management	4.74	4.66	.42	.519
Effort Regulation	4.77	4.72	.14	.711
Peer learning	3.73	4.16	8.09	.005
Help seeking	4.20	4.49	9.19	.003
Panel B: Performance (covariate: gender and GPA1W)				
Intro (mark on 40)	19.17	18.29	.89	.347
Adva (mark on 40)	17.50	18.77	.247	.117
Delta Intro–Adva	1.68	-.48	5.28	.022
Panel C: Performance on other courses				
GPA2W (mark on 480)	266.35	266.73	.01	.940

LBL = Lecture-based learning; TL = Team learning

Figure 1: Quasi-experimental design: untreated control group design with pre- and posttest



Note:
O = Observation
t_1 = pretest
t_2= posttest
X = treatment

Figure 2: Estimated marginal means are based on the ancova analysis with gender and GPA1W as covariate