IMPACT OF TEAM-BASED LEARNING ON HIGHER EDUCATION STUDENTS' PERCEPTIONS

L'IMPATTO DEL TEAM-BASED LEARNING SULLE PERCEZIONI DEGLI STUDENTI UNIVERSITARI

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ABSTRACT
Team-Based Learning is an interactive, effective learning space in higher education which promotes individual and group responsibility in learning. In A.A. 2022-2023, an experimental course was implemented at the University of Foggia combining TBL and e-portfolio to foster student reflection and self-assessment. This study explores the results of an anonymous ex post questionnaire administered to 149 students to investigate their perceptions on TBL.

Il Team-Based Learning (TBL) è uno spazio di apprendimento interattivo che promuove la responsabilità individuale e di gruppo nell'istruzione superiore. Nell'a.a. 2022/23 all'Università di Foggia è stata avviata una sperimentazione didattica che combina TBL ed e-portfolio per favorire la riflessione e l'autovalutazione degli studenti. Questo studio presenta i risultati di un questionario anonimo ex post somministrato a 149 studenti per investigare le loro percezioni sul TBL.

KEYWORDS
Team-based learning, active learning, higher education, self-assessment, formative assessment
Team-based learning, apprendimento attivo, istruzione superiore, autovalutazione, valutazione formativa

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1. Introduction

Team-based learning (TBL) is an active, student-centred, highly structured teaching methodology that stimulates student engagement (Carpenter et al., 2022). Learning proceeds both individually and in groups and aims at developing critical thinking skills, the ability to use critical thinking skills, the ability to apply these skills in a real context, the ability to self-reflect (Sweet & Michaelsen, 2023). TBL is particularly used in higher education, for large groups of students and in the first years of study. It is also an effective teaching method that stimulates active collaboration between students, self-assessment and peer evaluation. A TBL session has seven components: 1) preliminary self-study; 2) an individual test (I-RAT); 3) a group test (T-RAT); 4) possible appeal; 5) a mini-lesson; 6) group resolution of a practical case (T-APP); 7) peer assessment (Tsai & Jao, 2020). The TBL represents a unique teaching modality that stimulates the student to build knowledge through discussion with the group. In the first semester of the a.a. 2023-2024, an experimental TBL course was introduced at the University of Foggia (Dipace et al., *in preparation*). The aim was to enable the acquisition of subject-specific skills as well as soft skills such as team working and problem solving. The population consisted of 149 students of "Docimology" in the Primary Education degree course. The course took place in presence and the university's Moodle platform was used for the activities, supplemented where necessary by software such as Padlet and Mentimeter or tools such as Excel, Google Form and Google Sites. In addition, the course introduced an innovation to the TBL formula, including reflective e-portfolios as part of summative assessment to allow students to document the artefacts produced during TBL and provide scaffolding for their reflection and self-assessment (Hernandez, 2024).

The article aims to present data from a questionnaire administered to students at the end of teaching activities, created on the basis of a framework investigating the objectives, knowledge, motivation and engagement, organisation of study and effectiveness of the stages of the methodology. The purpose is to analyse and evaluate students' perceptions also based on the implemented implementations in order to be able to define endpoints and new research directions.

2. Methods

This study used an anonymous ex-post questionnaire to collect data. The students expressed their perceptions and attitudes towards learning, the classroom

experience, the course format and satisfaction with the methodology used. More specifically, the survey included 5 sections:

- A section concerning the student's perception of having achieved the course learning objectives, which were defined in the course syllabus using the six Dublin Descriptors (EHEA, 2005).
- A section concerning the evaluation of the effectiveness of team-based learning to promote the four types of knowledge, as defined by Anderson and Krathwohl taxonomy of cognitive processes (Anderson & Krathwohl, 2001).
- A section, consisting of ten items, concerning how team-based learning promoted motivational and engagement factors.
- A section, consisting of seven items, concerning which factors influenced the student's ability to organise their study.
- A section concerning the effectiveness of the single activities of team-based learning (I-RAT, T-RAT, T-APP, and the e-portfolio) to achieve the course's more general educational goals, namely qualification, socialisation and subjectification, as defined by Gert Biesta (Biesta, 2009).

Further sections, which are not included in this study, concern more specifically the e-portfolio as an assessment tool in the context of the course. All questions used a 5-point Likert-type scale (Joshi et al., 2015). In addition, the survey included four open-ended questions to collect students' perceptions of the strengths and weaknesses of the TBL and any suggestions for improvement, which are not included in this study. Data were collected in CAWI format using Google Modules and analysed using Jamovi software (Şahin & Aybek, 2020; *jamovi*, 2021).

3. Results

3.1 Students' perception concerning learning objectives.

The learning objectives of the course were defined in the course syllabus using Dublin Descriptors, in accordance with the University guidelines. We asked students whether they felt that participating in the course allowed them to achieve the intended learning goals related to six cognitive aspects (Table 1).

	Knowledge	**Understanding**	**Application**	**Communication**	**Self-expression**	**Learning to learn**

Mean	4.54	4.61	4.40	4.42	4.49	4.34
Median	5	5	5	5	5	5
St. Dev.	0.673	0.665	0.778	0.815	0.741	0.859
Min.	2	2	2	2	2	2
Max.	5	5	5	5	5	5

Table 1. Students' perception of having achieved the course learning goals.

None of the students rated their learning achievement lower than 2 out of 5 in any category: conversely, the median for all five indicators was "5" corresponding to the highest possible rating. In particular, the average was higher for the "understanding" dimension (4.61) and lowest for "learning to learn" (4.34); still, even the lowest mean values were very high on a 1 to 5 scale, indicating that, in general, students had a very high perception of achievement concerning the course learning goals. All the values correlated positively with each other (Spearman's Rho), with the highest correlation between "Application" and "Learning to learn" (147 df, $R=0.694$, $p<0.001$) and the lowest between "Understanding" and "Communication" (147 df, $R=0.461$, $p<0.001$).

3.2 Students' perceptions concerning the kinds of knowledge developed.

Next, we investigate the perception of the students concerning the methodology of TBL which was used throughout the course. The first set of questions concerned which kinds of knowledge they felt the course was able to develop. We referred to the Taxonomy of learning objectives (Anderson & Krathwohl, 2001; Trinchero, 2017) which was used to define the course learning goals and includes four kinds of knowledge: factual knowledge (concerning assessment tools and strategies), conceptual knowledge (concerning the principles and areas of application of assessment), procedural knowledge (concerning the ability to apply factual and conceptual knowledge to specific situations), and metacognitive knowledge (the awareness of one's' own cognition) (Table 2).

	Mean	Median	SD	Min.	Max.
Factual	4.52	5	0.776	2	5
Conceptual	4.56	5	0.791	1	5
Procedural	4.70	5	0.665	2	5
Metacognitive	4.61	5	0.685	2	5

Table 2. Students' perception concerning the course effectiveness at developing different dimensions of knowledge.

Students felt that the TBL methodology was able to effectively promote all four aspects of knowledge at a high rate, including procedural and metacognitive aspects which are usually harder to foster in more traditional settings.

3.3 Student perception concerning facilitating factors.

Next, we were interested in understanding which aspects of the TBL methodology were perceived by students as more effective in promoting learning achievements. We asked them to rate how different key aspects of TBL they found more helpful to organise their study (Table 3).

	Mean	Median	SD	Min	Max
Distribution of study contents	4.66	5	0.624	2	5
Structure of the course	4.59	5	0.678	2	5
Teacher feedback	4.31	5	0.892	1	5

Mini-lessons	4.09	4	0.972	1	5
Teams	4.42	5	0.806	2	5
Recourse and "burning questions"	4.09	4	0.937	1	5
Self-reflective questions	4.15	4	0.991	1	5

Table 3. Perceived importance of TBL features to structure learning.

All aspects were rated, on average, 4 out of 5 or more, indicating that students had a high appreciation of all the included aspects of TBL. Still, from the students' answers it appears that the very structured nature of the course, centered around five main "core contents" that informed TBL units, was perceived as very helpful to help students to organize their study. The use of fixed teams throughout the course was also perceived as extremely helpful. Although important, other features such as mini-lessons, self-reflective questions at the end of the activity, and the opportunity to contest and discuss the answers of I-RAT and T-RAT were comparatively perceived as less crucial.

3.4 Students' perception concerning motivation and engagement

Cognitive aspects are key for effective learning; however, to achieve effective outcomes other factors, which include students' attitudes, motivation, engagement, and the learning environment, are just as important. Such factors are often loosely described as "non-cognitive factors" and have been shown to significantly influence the quality of learning (Adebayo, 2008; Farruggia et al., 2018; Nagaoka et al., 2013; Sommerfeld, 2011). To investigate whether the course was effective in creating a positive learning environment able to sustain non-cognitive aspects of learning, we asked students to rate the perceived effectiveness of the course to promote those aspects (Table 4). Three items concern student perceived engagement with the activity and/or learning content; two items are related to the perception of empathy with the teacher and their peers. The last five items, more related to intrinsic motivation, were inspired by self-determination theory (Ryan & Deci, 2017) which identifies three key needs factoring in intrinsic motivation:

competence (which can be inspired by challenging oneself and their peers), autonomy (which can be promoted by the possibility of expressing oneself) and relatedness (which can be fostered by a feeling of sharing a common experience and challenging oneself and others towards a shared goal).

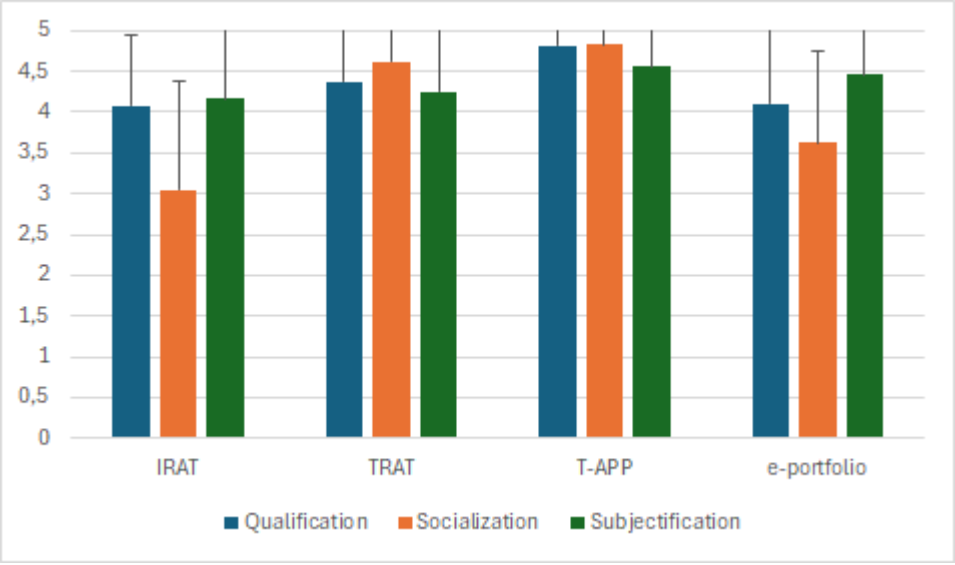
	Mean	**Median**	**SD**	**Min**	**Max**
Active participation	4.78	5	0.556	2	5
Interaction in the classroom	4.66	5	0.643	2	5
Engagement towards content	4.68	5	0.638	2	5
Empathy (with teacher)	4.68	5	0.650	2	5
Empathy (other students)	4.66	5	0.665	2	5
Self-expression	4.64	5	0.680	2	5
Sharing of the experience	4.62	5	0.674	2	5
Challenge (self-directed)	4.62	5	0.662	2	5
Challenge (other group members)	3.22	3	1.447	1	5
Challenge (other groups)	4.07	4	1.057	1	5

Table 4. Students perceptions related to engagement and motivation towards the activity

Taken together, the results indicate that students valued very highly aspects related to engagement, interaction, and empathy both with the teacher and the other students. They felt they had been able to express themself, to share the experience with their peers, and felt adequately challenged. Interestingly, from the students' answers it was apparent that they were more motivated by challenging themselves than by competing with other group members or other groups (although this was also an important factor in the students' perception).

3.5 Students' evaluation of TBL activities.

Lastly, we were interested in understanding which activities, part of the TBL methodology, felt more relevant for students, taking into account all educational aspects. To this aim, we referred to the model of Gert Biesta (Biesta, 2009) which identifies three fundamental goals of education, namely qualification (related to acquisition of meaningful knowledge), socialisation (the ability to act as a functional part of society) and subjectification (the ability to act as an independent and original thinker). In general, the students rated the activities carried out very positively concerning all three aspects (Graph 1).



Graph. 1. Appreciation of TBL activities for three dimensions of education.

However, analysis of the individual dimensions reveals significant differences in students' perceptions. The I-RAT presents effective learning as 4.08/5, socialisation as 3.05 and subjectification as 4.17 (Table 2); T-RAT presents effective learning as 4.38, socialisation as 4.62 and self-reflection as 4.25 (Table 3); T-APP presents effective learning as 4.82, socialisation as 4.83 and subjectification as 4.56 (Table 4); E-portfolio presents effective learning as 4.11, socialisation as 3.62 and subjectification as 4.46 (Table 5). Unsurprisingly, team-based activities (T-RAT and T-APP) scored higher on socialization than individual ones (I-RAT and e-portfolio); however, T-App scored higher than all other activities also concerning qualification and subjectification.

4. Discussion

The analysis provides us with useful information and allows us to understand how the students perceived the methodology adopted during the course. In general, the experimental course received a high degree of appreciation from the students, who expressed a very high perception of correspondence with the objectives set out in the teaching syllabus (Tab. 1). This aspect is, of course, not a sign of learning that has taken place; however, these data should be read together with the learning outcomes obtained, which will receive appropriate and subsequent analysis and discussion. The result is of great value especially considering that the recipients were first-year students of Primary Education, who took the course when they entered the university (during the first semester) and for the first time encountered a course based on the TBL methodology. Although during the early stages of the activities they were hesitant and sceptical in class in their approach to the demands and tools used, as the course progressed the students showed an important degree of participation and interest. In analysing the types of knowledge promoted by TBL, the study showed students' positive perceptions for all categories (Tab. 2). However, the students consider that the knowledge they developed the most were the procedural and metacognitive knowledge, which are usually the most difficult to develop even in undergraduate teaching (Yu, Yu, 2023). This aspect highlights that the proposed model could be optimised for effective course design in higher education (Aleksandravičiūtė, Liekis, 2020). In line with studies in the field (Darling-Hammond et al., 2017; Orland-Barak, Maskit, 2017) that orient teacher training toward research-oriented models, the course was designed in a highly structured way, identifying five key thematic cores and offering the content sequentially, with an experiential characterization and the constant recourse to feedback circularity. These aspects were highlighted as functional in promoting a method of study

organization (Tab. 3) also because students are active partners in the training, participating in the co-construction of learning through effective and reflective methodologies (Gillespie, 2012).

There is evidence of a perception of an environment that enabled effective learning processes even through non-cognitive factors (Tab. 4) that are important considering the target audience. First-year students need the support of the group as an identifying and aggregating element. There was the presence of positive competition within the group and with other groups in the class, and the challenge, in fact, was predominantly self-directed. Being able to test oneself individually with the I-RAT and then rely on the knowledge shared with the group in the T-RAT allowed the individual to enact mechanisms for growth and development. In the analysis of the I-RAT evaluations, the individual's performance improved over the succession of tests (Basta, De Martino, Tinterri, *in preparation*), perhaps also stimulated by a motivational drive of the individual in relation to the group. In the final evaluation of the individual proposed activities, there is a prevailing preference for T-APP as the most valued part of the model. Team application activities were built with careful design in view of teacher professionalism to be acquired in the area of assessment. Simulating classroom contexts and situations may have stimulated students more toward this type of activity that promotes simulation and direct experience (You, 2024).

Limitations of the study include the fact that the analysis of students' perceptions was conducted solely on an ex-post questionnaire that does not necessarily allow for the detection of actual learning, but only the perception of learning. The questionnaire was administered in the anonymous form to allow for a comfort of sincerity in the response. However, this aspect does not allow perceptions to be related to student performance. There is a need to further investigate through qualitative analysis the open-ended responses in the questionnaire as well in order to complete the reflection. Finally, we also highlight the time consuming nature of designing activities and relating the perceived effectiveness of TBL to the commitment required by the teacher, in the cost-benefit analysis.

5. Conclusions

The study’s findings indicate that first-year university students are able to perceive the significance and educational value of specific instructional activities in their courses. Reflective TBL, through the use of sequential individual and team-based learning activities, is confirmed by our findings as a space to create educational

value not only in terms of effective knowledge acquisition, but also as an opportunity for students to socially construct their learning and develop critical self-reflection skills. The analysis carried out allows us to state that active methodologies, such as TBL, enable teachers to be able to make the teaching process meaningful, stimulating motivation and engagement. In experimentation, the integration of the e-portfolio into TBL also allows for the possibility of being able to deepen the reflective and self-reflective dynamics already present, in order to be able to improve the educational relationship in a large classroom setting such as a university classroom. Experimentation with a control group should be carried out in the future to assess the actual effectiveness of the methodology as structured; however, the results make it possible to continue with the study and analysis of new possibilities for implementing the method.

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