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COLLABORATION & ASSESEMENT:

THEORY AND PRACTICE

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PART 1: THEORY

INTRODUCTION

The analysis of this learning story has been organised into five connected pillars:

- Collaborative learning
- Learning communities
- Problem and project-based learning
- Group or team work?
- Assessment of group/team learning.

1: COLLABORATIVE LEARNING

This document introduces the overall principles of collaborative learning. For a more complete approach to collaborative and cooperative learning, and on group organisation and dynamic, see "What is the Collaboration model, and how to use it?" from the phase I of the Creative Classrooms Lab project.

According to Smith and MacGregor (1992), "collaborative learning" is a comprehensive concept applicable to several educational situations, and involves the combined intellectual effort of students or students and teachers. During collaborative learning students work mostly in small groups for understanding phenomena or facts, finding solutions or exploring topics, understanding or creating products.

Kenneth Bruffee (1973), based on social studies conducted by Émile Durkheim, concluded that collaborative work arises in a rather spontaneous manner, even when challenged by routine traditional education. However, it will arise more frequently and with greater intensity where the teacher promotes a learning context and environment which is more conducive to such process. To create these conditions the teacher must rethink his/her role, become the organiser of people within communities with a specific learning purpose in mind. It is not just a question of 'how much' freedom or discipline to 'give' to students. It involves reallocating that freedom and discipline in the classroom, and setting up a collaborative, multicentric learning community, where the teacher shifts to the perimeter of action. It is important to note that teachers are not forced to not intervene, nor must they waive their responsibility to educate. They do however reinterpret such responsibilities, and realise that their main task is to organise the learning community.

Among the group's members, sharing goals and responsibilities helps to develop a sense of collective and individual benefit, arising from the successful sharing. Johnson and Johnson (1995) call it creating "positive interdependence" (see Figure 1), which they find to be at the heart of collaborative learning, resulting from a psychological process of expanding personal interest into common interest, related to setting new goals and new motivations, in contexts where one finds both cooperation and competition.

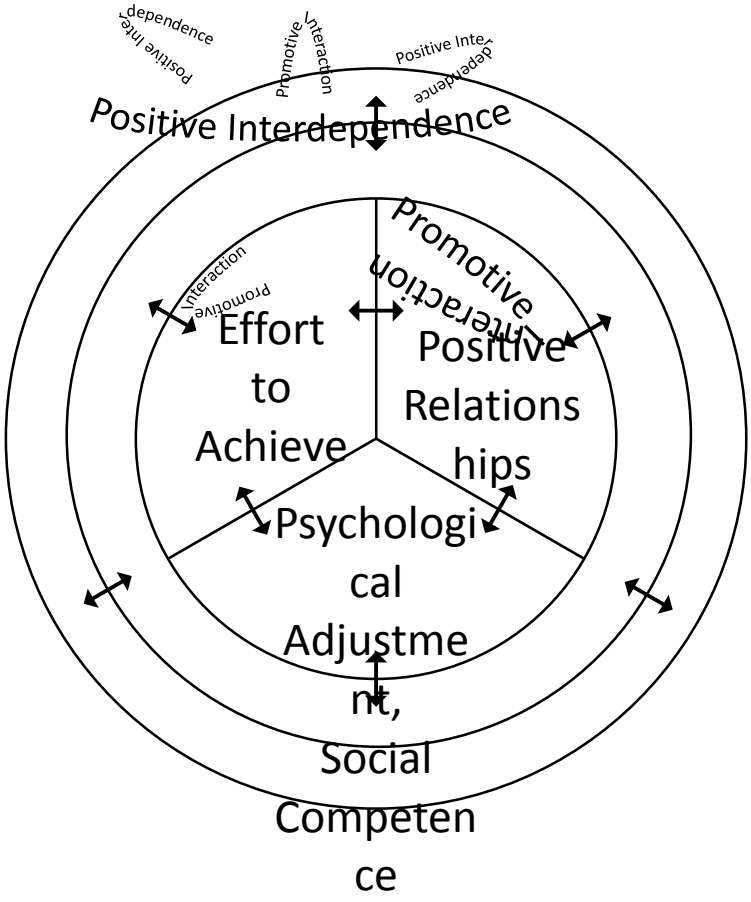

Figure 1 Positive Interdependence (Source: Outcomes of cooperation, Johnson & Johnson, 1995, p. 47)

2: LEARNING COMMUNITIES: FROM COMMUNITIES OF PRACTICE TO COMMUNITIES OF LEARNING

In the early 1990s, Lave and Wenger (1991) proposed an operational definition of community of practice:

> A community of practice is a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice. A community of practice is an intrinsic condition for the existence of knowledge, not least because it provides the interpretive support necessary for making sense of its heritage. (Lave & Wenger, 1991, p. 98)

More recently, Wenger (2013) republished "Communities of Practice: A Brief Introduction", where he describes communities of practice as groups of people who share a common concern or interest in something they do or wish to learn to do better, thus interacting regularly with each other. In the aforementioned publication, Wenger considers three core features which a community must have to be a community of practice, thus making it different from the social concept of community:

(1) *The domain* – a community of practice has an identity defined by a shared domain of interest and membership, therefore implying a commitment to the domain and a shared competence that *distinguishes members from other people;*

(2) *The community* – in pursuing their interest in their domain, members engage in joint activities and discussions, help each other, and share information, they build relationships that enable them to learn from each other;

(3) *The practice* - a community of practice is not merely a community of interest–people have certain tastes. Members of a community of practice are practitioners, who have developed a joint set of resources, experiences, stories, tools, ways of solving recurring problems, in brief who have a shared practice.

Communities of practice, as defined by Wenger (2013), may be transposed to the educational context in view of creating learning communities which may target a variety of goals and encompass different members, such as students, teachers, parents and political decision makers.

In a learning community one may perform a large variety of activities, although specific activities may be proposed, like problem-solving, information research, experimenting, object reuse, organising field trips, drawing collectively knowledge representation maps, developing documentation projects, etc., thus promoting synergies, argumentative discussion conducive to project development and learning, and the critical analysis of work in progress and completed.

3: PROBLEM-BASED LEARNING AND PROJECT-BASED LEARNING

Learning from Antiquity to the present has taken place according to models of interaction between the learner and the environment, involving problem-solving, learning by doing, supported by informal strategies of search and developing critical thought. In our classroom, problem-based learning or based on project development is still a relevant methodology and suitable for the development of skills for the knowledge-based society.

On several occasions, the concepts of problem-based and project-based learning are not differentiated (Larmer, 2014) and, in all truth, both approaches stem from the same constructivist root. The model assumes activities conducted in a group. To start, the group is given a problem or a short presentation of the problem case, which functions as a 'trigger' for the learning activity. Through reasoning, students revisit systematically the ideas on several topics, they submit their explanations and, during this process, they underline what they need to learn (Hendry, Frommer, & Walker, 1999).

In project-based learning, students engage in meaningful and real problems, which are important since they resemble the problems scientists, mathematicians, writers and historians tackle. In the classroom where students learn through project development, they research, formulate and test hypotheses, using near-scientific methods, discussing their ideas and substantiating their views, either by questioning oneself or being challenged by the questions raised by others, or otherwise experimenting on new ideas.

Project-based learning helps students learn by creating and applying ideas to real world activities, which are similar to the activities performed by adults. According to Krajcik and Blumenfeld (2006, pp. 317-318), this is a form of learning grounded in constructivist principles, which highlight that students deepen their understanding of the world when they construct knowledge actively, working on ideas and using them.

Larmer and Mergendoller(2010) underline seven essentials for good project-based learning: (1) need to know or motivation; (2) a driving question; (3) student voice and choice; (4) 21st century skills; (5) inquiry and innovation; (6) feedback and revision or recast; (7) publicly present the project.

Accepting these as the essentials for project-based learning, the teacher should be able to motivate students, by challenging them with a motivating problem that will arouse their curiosity. Therefore, it will generate in students knowledge deficit, it will create further the need to set milestones by providing a guideline-question for guiding students in their learning process, ending with the mandatory inclusion of students' opinions and aspirations in the work project. The development of essential 21st century skills is intended not only to help students exercise familiar or their favourite skills, but also to provide them the chance to improve and enhance such skills, by challenging them to search and find new learning forms. Monitoring the process of project development entails providing feedback and reintegrating it in the project cycle, possibly rewriting the goals and strategies for meeting such goals. Finally, publishing the project's findings lends it meaning, potentially fostering students' self-esteem and raising the chances of their commitment and the skills developed being acknowledged externally.

4: GROUP OR TEAM WORK? COOPERATING OR COLLABORATING?

Collaboration in any ecosystem is something that can be done in different forms and conducted in different directions. Depending on the participants or stakeholders in the ecosystem, collaboration may follow a cooperative or collaborative model, hereby drawing closer to the representation proposed by Dubberly and Pangaro (Dubberly & Pangaro, 2010), as shown in Figure 2

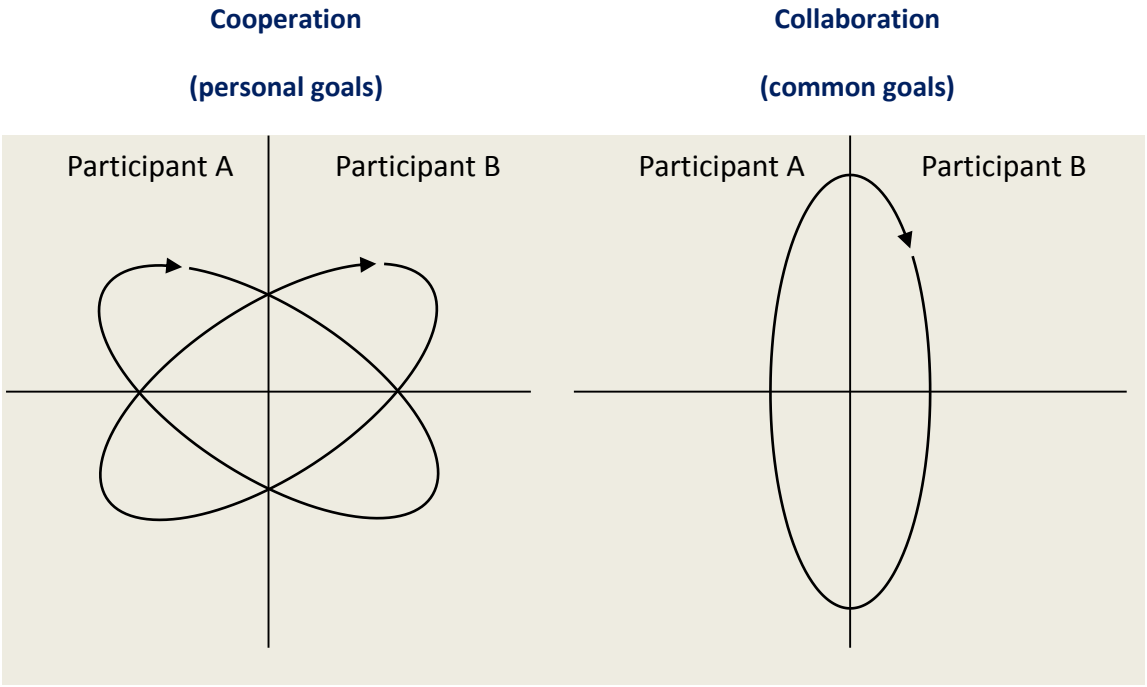

Figure 2 Representation of the interaction between goals and actions (Dubberly & Pangaro, 2010, p. 157)

The drawing on the left side shows participants A and B seeking each other's help to perform the tasks. A's goals and B's goals may be different, but either offers to help the other meet his goals.

In the drawing on the right, participants agree to collaborate in setting the goals and choosing the methodology to meet these goals. Consequently, they converge towards a system of common actions and goals which, notwithstanding some loss of individuality, reduces personal costs.

Collaboration appears as the culmination of a cooperative dynamic, beginning in a community and developing as its participants develop several skills, which can be identified, for example, through the analysis of the "collaboration pyramid" proposed by Oscar Berg in 2012 and revisited recently (Berg, 2014). Among the myriad of representation models of the collaborative process, this pyramid has the advantage of being simple and clear, where one can identify the flow from the base up to the upper vertex through three levels or steps (see Figure 3).

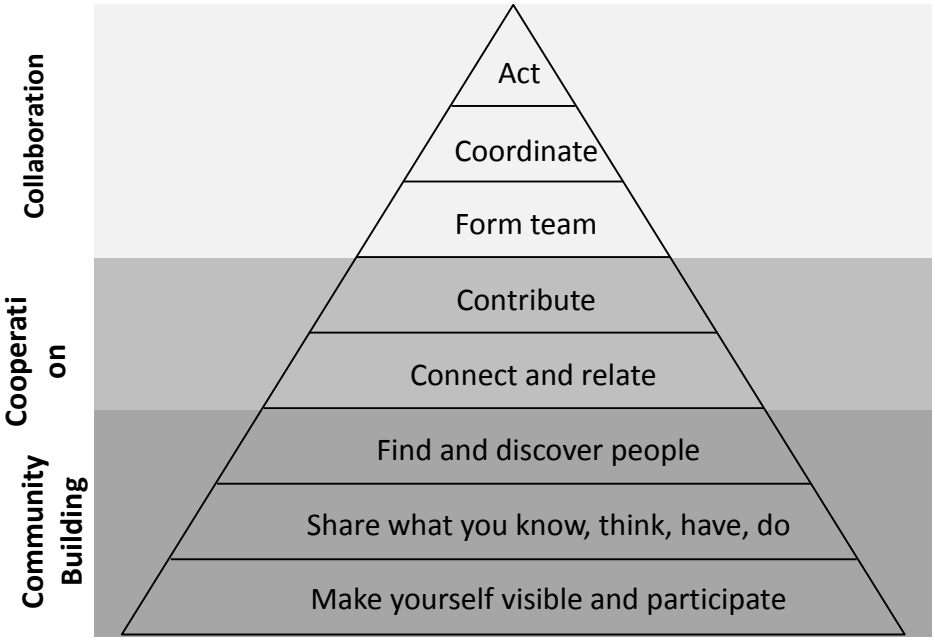

Figure 3 Collaboration pyramid conceived by Oscar Berg (2014)

At the first level, we find the community building phase, which may be a community of interests, a community of learning or a community of practice, and include students, teachers and relatives, for example. This level corresponds to the exploration of the community, mostly through observation mechanisms and occasional inquiry, which is followed by identifying specificities, characteristics and skills or the interests of the community's members. It is at this level that the profiles of individual elements can be identified, the necessary profiles for organising the community's internal groups. Cooperation processes involve more visible and intense inputs, where some members are required to intervene in moderation and regulating intermediation activities. Finally, at the top of the pyramid, leaderships take shape and working groups are reorganised, forming teams, and members collaborate to meet community goals (and no longer individual goals). The leaders stand as the defining elements of the community, thus showing their capacity to coordinate efforts towards common general interests, taking the initiative to organise and foster the activities. Although in small number, they are actually the ones who keep the community operational.

5: ASSESSMENT

Assessing is increasingly a dimension of teaching and learning and, therefore, the concepts relating to assessment are linked to learning concepts. Maryellen Weimer (2002) identifies five key changes for more efficient teaching practice:

- The role of the teacher, who must focus on students' learning and acts as a facilitator;
- The balance of power, i.e. faculty share decision-making about learning with students, in ethically responsible ways; teachers control less, and students are involved more;
- The function of content, with the goal of building strong knowledge foundations, used to develop learning skills and learner self-awareness, without separating learning strategies from content;
- The responsibility for learning, which requires that schools create learning environments that motivate students to accept responsibility for learning in a constructive classroom climate;
- The processes and purposes of evaluation, considering that evaluation activities should also be used to promote learning and to develop self and peer-assessment skills.

Simplifying this, assessment is collecting information, while assessing for learning is much more complex. Assessment, Rita Berry (2008) sustains, involves social interaction between teachers and students, and among students themselves, who share a common view about learning. Assessment is "the activities used by teachers and students for gathering information, analyzing and interpreting it, drawing inferences, making wise decisions, and taking appropriate actions in the service of one's learning" (Berry, 2008).

Other authors address three forms of assessment:

- Assessment of Learning (AoL), mainly composed of tests and exams;
- Assessment for Learning (AfL), which provides better feedback to students and allows them to use that information in the following stages of learning, and establishes a link between summative assessment and formative assessment;
- Assessment as Learning (AaL), which encourages students to take responsibility, while fostering their learning. This characteristic highlights assessment as a metacognitive process, i.e. a process of learning to learn and understanding how to understand. According to Rita Berry, when assessment is regarded as learning, students become their own assessors; they monitor and analyse critically what they have learnt, and make the most significant adjustments and changes to their knowledge (Berry, 2008).

CREDIBILITY OF THE ASSESSMENT: VALIDITY AND RELIABILITY

Assessment is a process which, apart from its complexity, must be acknowledged as useful and authentic. Giselle Martin-Kniep states that assessment is authentic when it involves the student in real life issues, in topics or tasks addressed to those who are concerned with what they learn. Authentic assessment gives the student an opportunity to show off what they have learnt, and mostly marks the culmination of a project (Martin-Kniep, 2000). Martin-Kniep identifies eight attributes in authentic assessment, as described in Table 1.

Table 1 – Attributes of authentic assessment, according to Martin-Kniep (2000, p. 28)

Attributes of authenticity	Check requirements
(1) Real purpose and audience	- students solve a real problem in a way that enables them to benefit from their work
(2) Integration of content and skills	- students build upon prior knowledge and apply knowledge and skills from related areas
(3) Disciplined inquiry and academic rigor	- students search for in-depth understanding through systematic research and inquiry using a variety of sources
(4) Explicit standards and scoring criteria	- students participate in the identification of performance standards for the task and in its articulation
(5) Elaborate communication	- students communicate what they think, they know and can do through different communication media
(6) Levels of thinking	- students use basic and higher levels of thinking in tasks that call for a combination of skills and forms of knowledge
(7) Reflection, self and peer-assessment and feedback	- students reflect on processes and products through ongoing questionnaires, checklists or rubrics. They formally evaluate their own and each other's learning through ongoing feedback from both teacher and their peers.
(8) Flexibility in content, strategies, products and time	- the assessment task allows for student-generated choice of content and strategies, according to the student's profile.

The analysis of Martin-Kniep's (2000) attributes of authentic assessment highlight the student's role in assessing his own learning, both in terms of self and peer-assessment.

WHY ASSESS?

According to Falchikov (2005), assessment is important, not only as an end in itself, but also to respond to those who need or use the findings of the assessment, from both a summative and a formative perspective. Formative assessment is more focused on the student, comprehending diagnostic, motivational, feedback and learning improvement goals; the student himself is involved in the process. Summative assessment certifies and evaluates what the student knows against standards.

HOW TO ASSESS LEARNING?

Assessment is conducted using different methods: quantitative, which is concerned with "measurement", and qualitative, which tends to acknowledge better the complexity of the learning process and the assessment process thereof. Qualitative assessment uses criteria and seeks to describe consistency between the goals and student performance.

One may evaluate the learning process against the products thereof, either in an on-going fashion or at the end of a cycle, internally or externally, in a convergent, i.e. seeking single answers – the right answers – or divergent manner, accepting multiple answers, the answers reflecting different viewpoints, thus valuing student creativity. One may resort to an ideographic dimension of assessment, favouring the representation of ideas, or choose the nomothetic dimension, which is more formal, and focuses more on built knowledge.

According to Falchikov (2005), assessment may be intrusive when students know that they are being assessed, or discrete when students are unaware of such assessment. However, the latter may raise arguable ethic issues, although it can be useful in specific contexts. The author also finds that there is a traditional assessment method, one that is conducted by teachers only, and an alternative methodology involving teacher and students, as mentioned before.

The following table (Table 2) summarises what may be assessed and methodological effectiveness as addressed by Nancy Falchikov.

Table 2 The link between what is assessed, methods and effectiveness

What to assess?	Which method to use?	What was the effectiveness?
Case studies	Traditional (by teacher) or Alternative (students may be involved) Formative and/or summative	Some theoretical evidence put into practice.
	Formative and/or summative	Personal experience guarantees usefulness.
'Decentralised assessment'	Alternative (self-assessment; peer-assessment)	Evidence of good teacher-peer agreement.
	Formative and/or summative	
Expository	Alternative (involving students)	Some beneficial evidence (students provide evidence supporting assessment).
	Self-assessment	Little or no evidence.
	Formative and/or summative	
Interviews	Alternative?	No meaningful evidence.
Newspapers Records Logbooks	Alternative (students are involved in choosing contents + some self-assessment) and Traditional	Proponents claim benefits, but there is only some small evidence of effectiveness.

What to assess?	Which method to use?	What was the effectiveness?
	Formative and/or summative	Personal experience ensures usefulness.
Learning agreements	Alternative (agreement between student and teacher) and Traditional (depending on what was assessed)	Small concrete evidence found.
	Self-assessment	Personal experience guarantees usefulness.
	Formative and/or summative	
Negotiated reports	Alternative (assessment negotiated between student and teacher or supervisor)	No meaningful evidence.
	Self-assessment	
	Formative and/or summative	
Remarks	Predominantly traditional	No meaningful evidence.
	Summative and/or Formative	
Oral presentations	Alternative and Traditional	Deemed overall effective and beneficial for students. Fosters active participation, uses analytical skills and applies criteria, tact and diplomacy.
	Self and peer-assessment	
	Summative and/or Formative	
Portfolios	Alternative and Traditional	Proponents claim benefits, but there is only some small evidence of effectiveness.
	Students are involved in choosing the contents	
	Self-assessment	
	Traditional assessment of product (by teacher)	

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What to assess?	Which method to use?	What was the effectiveness?
	Formative and/or summative	
	More production guidelines available	
Records/learning profiles	Formative	No meaningful evidence.
Games and Role play	Alternative, Formative?	Proponents claim benefits, but there is only little evidence of effectiveness.
Work-driven learning	Alternative and Traditional	Proponents claim benefits, but there is only little evidence of effectiveness.
	Self-assessment	
	Formative and/or summative	

Adapted from Falchikov (2005, pp. 23-26)

WHAT TO ASSESS IN COLLABORATIVE LEARNING?

Considering that collaborative learning involves a variety of skills that students require for their integration in everyday life, it does not make sense to limit learning assessment to course contents. On the contrary, all skills should be factored in. For the present purpose we shall assume skill as "the capacity to perform tasks and solve problems", underscoring that skill is not restricted to cognitive elements, but also encompasses interpersonal functional aspects, as described by CEDEFOP (2008).

Koenig (2011) finds that, in collaborative learning contexts, assessment must address cognitive skills, interpersonal skills and intrapersonal skills.

A. COGNITIVE SKILLS

Oral comprehension and reasoning skills, math knowledge and skills and writing skills are among the core cognitive skills. Alongside these skills, there are also those used for problem-solving, skills for obtaining and using old knowledge in a new way, in view of solving new, non-routine problems. The P21 (Partnership for 21st Century Skills, 2009) also acknowledges that students need to develop core skills to be successful in today's world, like critical thought and problem-solving, besides communication and collaboration skills.

B. INTERPERSONAL SKILLS

Interpersonal skills are needed for students to relate with other people. These include a variety of skills, like knowledge of social habits and the capacity to interact and solve problems related with social expectations. Successful interpersonal behaviour involves a set of complex cognitive tasks and on-going adjustment of social performance based on other people's reactions (Koenig, 2011, p. 42). As highlighted by Bedwell et al., historically speaking there are two separate outlooks on interpersonal skills. One addresses interpersonal skills as rather stable characteristics, like personality, whereas the other regards these skills as a molecular model, which can be influenced by environmental and situational factors.

In more general terms, interpersonal skills involve a complex combination of psychological factors, of emotional, behavioural and cognitive nature (Bedwell, Fiore, & Salas, 2011). Other authors include under interpersonal skills "goal-directed behaviors, including communication and relationship-building competencies [collaboration skills], employed in interpersonal interaction episodes characterized by complex perceptual and cognitive processes, dynamic verbal and non-verbal interaction exchanges, diverse roles, motivations, and expectancies" (Klein, DeRouin, & Salas, 2006, p. 81).

A. Communication skills

To communicate does not mean to use only verbal communication skills. To communicate effectively and to exchange information with others we need to combine forms of assertive communication, which may be written, verbal, active listening or non-verbal (Klein et al., 2006, p. 99).

B. Collaboration skills

Cooperation and coordination, trust, intercultural sensitivity, task-oriented, self-presentation, social influence and conflict arbitration skills are a set of skills which Klein et al. deem essential for relationship-building (Klein et al., 2006, p. 102).

C. Interpersonal skills

Considering Gardner's (2011) definition of intrapersonal intelligence, personal skills may be described as those which allow the individual to trace a mature profile of him/herself. "In its most primitive form, the intrapersonal intelligence amounts to little more than the capacity to distinguish a feeling from pleasure from one of pain and, on the basis of such a discrimination, to become more involved in, or to withdraw from a situation. At its most advanced level, intrapersonal knowledge allows one to detect and to symbolise complex and highly differentiated sets of feelings" (Gardner, 2011, p. 253). In this conceptual framework, intrapersonal skills may include adaptability from one perspective, and self-management or self-development from another perspective, as suggested by Klein et al. They regard adaptability as one's ability to learn to perform new tasks, to use new technologies and willingness to cope with different, uncertain, new circumstances, while responding effectively to emergencies or crisis situations. Self-management is the ability to work remotely, in virtual teams, to work autonomously, and to be self-motivating and self-monitoring (2006, p. 63). Intrapersonal skills may include the commitment to achieve better results, know more, enhance one's well-being and improve self-esteem. They are in many ways related to interpersonal skills, although self-directed and not directed to others (Sternberg, 2009).

In brief, literature suggests that the following be assessed:

(1) The cognitive dimension, according to one's ability to solve problems, make decisions, innovate, be creative, organise and plan;

(2) The interpersonal dimension, according to communication skills, the ability to influence others, to learn from interaction, leadership skills and team work, the ability to promote relationships and manage conflicts;

(3) The intrapersonal dimension, considering the ability to adjust, to be determined, to tolerate stress, to be motivated and aware.

WHO ASSESSES LEARNING?

A. SELF AND PEER-ASSESSMENT

Self-assessment involves applying analysis criteria to one's own work or performance in an activity, thus acquiring a formative dimension.

According to the student's level, the criteria can be set by the teacher, peers or independently by oneself. Self-assessment, in general, functions better when criteria is provided, and it is efficient for both individual activities and global tasks (Palloff & Pratt, 2009, p. 104). Self-assessment can also involve reflection, thereby encouraging students to think about the concepts learnt and to apply them in a different manner, summarising thoughts and evidence of the original thinking (Palloff & Pratt, 2009, p. 105). At the end of a collaborative activity, it is suitable to request from the student an overall assessment of the group's work, and the assessment of his own inputs and participation, while using the same model to assess the inputs and participation of the other members of the group.

According to Palloff et al., peer assessment can be used to question both the process and the results. This can be carried out in the form of a personal email or a questionnaire and include the self and peer-assessment of the other group or team members, expressed on scale or in the form of a narrative (2009, p. 116). Rita Berry suggests that, in some cases, checklists or learning blogs are the best way of assessing students' learning strategies and well built self and peer-assessment exercises are valuable learning experiences and encourage learning (Berry, 2008, p. 16).

In some authors' views, self-assessment can help students set learning targets and, thus, learn on their own, while peer assessment contributes constructively to collaborative work. However, one needs to consider the pros and cons of peer and self-assessment, as the studies by Hanrahan and Isaacs highlight. These authors concluded that such assessment is hard, it raises objectivity issues, it is time consuming and uses up other resources as well, causes implementation problems, and some discomfort among students due to excessive criticism from peers. Furthermore, it is not often taken seriously. Besides, it is not easy to expose the work to the appraisal of peers, although it does help students to improve their understanding of correction criteria used. This assessment method is productive, since feedback is part of learning, and it helps create empathy with teachers, thus improving motivation to perform better (Hanrahan & Isaacs, 2001).

B. TEACHER ASSESSMENT

A teacher's assessment is primarily intended to provide feedback and conduct a summative evaluation of students' work, although it can also be formative.

From the formative perspective supported by Wynne Harlen (2007), the feedback that a teacher gives his student must focus on the advice about how to improve or continue his work, and avoid making comparisons with others. Therefore, students improve their understanding of the goals of their work and develop an objective idea of what is quality work. Another feature highlighted by Harlen was the dialogue function between teacher and student, which he found encouraged thought about learning, creating learning opportunities through the teacher's insight.

Besides the feedback they provide, teacher's comments are always a good way of acknowledging the quality of student work, and informing the school and family about the educational process.

ASSESSMENT IMPLICATIONS

The success of learning is closely related with strategies and student motivation, as Ames and Archer concluded (1988). A study focusing on student's views on the learning goals set in the classroom and the connection thereof with the use of effective learning strategies, the choice of tasks, attitudes and and the attribution of cause, found that modifying and changing the nature of students' experiences in the classroom may help target learning towards their goals (Ames & Archer, 1988, p. 265).

It was thus concluded that the chosen learning scene can impact how the student lends meaning to his tasks and directs his motivation. Based on this assumption, the following section provides some advice on designing a work scenario and collaborative assessment.

PART 2: PRACTICE: SUGGESTIONS FOR DESIGNING LEARNING ACTIVITIES

DREAM

After selecting the topic to be addressed, form teams by organising students according to their characteristics into heterogeneous and homogeneous groups. Literature shows that high achieving students normally perform better when in heterogeneous groups, while students with learning difficulties improve their performance in heterogeneous groups. On the other hand, students with lower skills feel even more challenged when they are put in low-skill groups. You can always opt for a more flexible strategy, and ask students to form groups on their own, which usually turn out being homogeneous groups. To preclude such an outcome, you may set the requirements for group formation and thus arrive at a mixed solution of self-grouping and teacher control regarding group composition.

Using work methodologies involving everyone, both students and teachers, set up a work plan which awards a separate part to each element, and describe individual and group goals. Collaborative digital tools, like Padlet (www.padlet.com), MindMup (https://www.mindmup.com) or analogue tools, such as a white board, post-its and coloured markers, are useful tools for keeping track of a brainstorming session.

Begin by clarifying the goals which, in addition to the end product under the curriculum, must be considered when deciding the assessment methods of the final work outcome and the production procedure. The assessment must address personal inputs of group members and collective performance, and is expected to highlight what can be improved and how that can be done. The usefulness of the information recorded was taken into account, including how it can be used to improve the learning process and tasks conducted. In other words, it should be possible to use data collected, feedback, comments, opinions and suggestions in the productive cycle itself.

One should be able to maintain the dream of conducting team work and, at the same time, to discover and identify personal inputs, decide how to record them, how to collect feedback from students themselves, from their classmates and from teachers. It is necessary to find ways of incorporating such feedback in learning to improve the process and the product, hereby reflecting each individual's participation in the personal and team's goals. In brief: the project should envisage discovering self and peer-assessment methods which may be implemented in a transparent manner and with the acceptance of the group.

EXPLORE

In this stage, teams apply techniques and ways of recording and collecting information about each group member's inputs and the research conducted for developing the project. Furthermore, they are expected to design a personal information organisation and input monitoring model, hereby constructing their self-assessment plan. Depending on personal preferences and resources available, each student may choose to use more compact recording methods, like the checklist, or more descriptive means, e.g., diaries, learning records, one's own reflections, notebooks or roadmaps, etc.

The teacher may take part in the process by helping to standardise the tools which the group will use, thus ensuring the gathering of information into similar groups, which in turn will help streamline each student's self-assessment and use it in the team assessment. On the other hand, by encouraging the structuring of diversified recording tools they may be used for peer assessment, thus lending greater equality to the assessment and enhancing its internal credibility. The teacher may even follow the same working model and build for himself an identical self-assessment model.

Depending on the students' skills and available resources, online tools can be used to set up checklists, keep written or verbal diaries, draft forms and voting systems, and focus on the systems that enable collaborative work in real time, Google Drive or Zoho for example.

MAP

This stage is intended to outline the end product, while highlighting the individual inputs for the team goals. The product is both the response to the curricular challenge chosen under Dream and group internal monitoring tools, while seeking to identify individual responsibilities in the project and the way to monitor them critically through self and peer-assessment. The assessment tools or media used can help, at this point, to assess better usefulness and efficiency in the next process. Each team must understand how these self-regulation and self-assessment tools function, in order to promote their use for the benefit of the team, while fostering personal accountability. Such awareness, which is revealed through intrapersonal and interpersonal skills, helps to understand that the final assessment of group work may be different from individual assessment by its members.

There are a variety of mapping tools which may be used. One may choose between those available online, such as concept maps, storyboards, sketch maps, flow charts, diagrams and information graphics, among others.

MAKE

In Make, the teams implement the projects structured before, creating an prototype. It is also advisable to use quality control and project progress mechanisms, setting the required tools and scales. It is in this stage that the self-assessment tools can be combined with progress recording tools, hereby analysing the envisaged individual inputs and its impact on performance. The graphical representation of data collected makes it possible to compare the initial plan with its implementation and, thus, enhance collective and individual success opportunities. While the members of the group are the main beneficiaries of self-monitoring, sharing with other groups the solutions found can leverage the positive effect and improve peer assessment quality.

There is a large variety of digital tools which support monitoring, such as project management systems for more advanced students (for example, www.asana.com, https://freedcamp.com). Learning management systems and electronic portfolios, for example, may also be used creatively to monitor project progress and the personal commitment of team members.

ASK

In this stage it is crucial to use collection tools for the information produced in the group, through self-reflection and group discussion, and outside of the group, with teachers, relatives and experts in the field of the project or prototype. Instrument structuring, ease of use, adjustment to purpose, speed of analysis of data collected and representation or visualisation are the main concerns of the teacher(s). First, the appropriate structure for the purposes, i.e. the use of items or objective questions in questionnaires or checklists, reduces time consumption. The ease of use increases the chance of it being applied to a greater number of potential informers and in different contexts. The speed at which data can be extracted and inferences, comparisons, simulations may be made enhances the efficacy of the feedback and fosters its use in the next process. Graphic representation or imaging helps the group to acknowledge the state of the art and decide on future actions.

Systems requiring less human intervention in data analysis, like online forms, provide good support. The Achilles' heel, however, is designing the tool and the data it collects. Quantitative data may be easier to use than qualitative data, but they do not always possess the informational and educational wealth of the latter. It would be interesting to find a form of compromise in this process of quantitative and qualitative data collection and processing. One may even use a mechanism for converting information collected qualitatively into quantitative representation.

REMAKE

The final development stage of the prototype will include the improvements identified in the previous stage, thus serving to perfect the group's internal assessment tools, the self and peer-assessment systems and draw the lessons for the subsequent projects. It is an opportunity for trying new solutions in aspects that the previous options may have not been as successful as the team had expected.

SHOW

The goal is to show the world that as a team we can do much more interesting things than if we do on our own, individually. Therefore, the end product is shown to the community, to as many recipients as possible.

The team should be capable of promoting the individual's work, highlighting his positive features and supporting him collectively. In spite of arising from individual inputs, the product is more than the sum of the parts, so the value of team work should be manifest. Regarding the tools used to collect feedback from the audience, based on simple and direct assessment systems, students may use that information to calibrate their own internal assessment tools.

Teams may not disregard any organisational detail needed to present the end product, while keeping track of the individual inputs and responsibilities. Consequently, they may pick up more easily on the "audience's" feedback and incorporate it in future projects.

Teachers and experts who have taken part in the process also play a very important part in this stage, particularly since their feedback may be regarded as part of the social acknowledgement and appreciation of students' work and team composition.

Sharing the conclusions and findings through online publishing, either open or closed to the groups and related persons only, will help increase self-esteem and individual accountability for the team's work. Creating a space on the web and publishing channels for showing off the work performed by the team may be one way of obtaining a more consistent involvement of less active members, thus contributing towards enhancing self-esteem and creating a group identity.

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