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A Goal Oriented Approach to Hybrid Learning in Higher Education Through the Use of the Ecosystem Model: a Case Study of Course Delivered at Université Des Mascareignes (UdM), Mauritius

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A Goal Oriented Approach to Hybrid Learning in Higher Education through the use of the Ecosystem Model: A Case Study of Course Delivered at Université des Mascareignes (UdM), Mauritius

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Abstract. Higher education in Mauritius is undergoing major curricular changes. To cope with these changes and to reach a wider and more diversified public, Higher Education Institutions (HEIs) are using Information and Communication Technology (ICT) tools like customized teaching, online learning and virtual campus. Online learning platforms widely adopted by Université des Mascareignes (UdM) offer learners and teachers hybrid education - blended learning, referred to as technology-mediated instruction. Hybrid learning mixes online educational resources and online engagement with traditional classroom techniques. When hybridizing courses, the pedagogical and technical teaching methods are reconsidered. This article examines the application of the Hy-Sup Model, a hybrid system with an Ecosystem typology capable of supporting reusable lifelong learning and facilitating decision-making by concerned parties at different levels. The Hy-Sup model based on a goal-oriented approach has the objective to provide with the Ecosystem typology a method to design, implement, analyse, evaluate and improve such systems.

Keywords: Blended Learning, Ecosystem typology, Hybrid education, Hy-Sup Model, Online learning, Pedagogical teaching method.

1 Introduction

One of the main characteristics of blended and hybrid education is flexibility on several levels: greater accessibility to university/adult education, fewer time-space constraints [1] better study-work-life management [2], good mix of human-technology interactions [3]. The methods of downloading activities or only putting course activities online are not really hybrid teaching. When hybridizing courses, one should also reconsider pedagogical methods and their technical teaching methods. Two key research questions were formulated to better address the idea of hybrid learning: (1) Which pedagogical strategy should be chosen? and (2) Which dynamic activities can be online?

2 Background Study

2.1 The Hybridization Process

Blended and hybrid learning approaches present students with a number of options by integrating the greatest features of in-person education and online learning. Many students have had access to high-quality education that is specifically tailored to their interests and the requirements of their courses and programs for more than ten years thanks to the blending of formats. In times when it was challenging to reach educational facilities due to health constraints, the sorts that mix blended learning, connectivity, and remote working proved to be something of a benefit, allowing lessons to go uninterrupted [4]. During the hybridization process several elements must be considered. Endrizzi [5]speaks of the learner as the one who should be at the heart of teaching: in particular supporting feedback, autonomy, diversity and reflection of learning methods. Thus, the hybrid formula 'puts the classroom as a physical space and the teacher in his role of conductor back at the center of thinking […] gives a new meaning to face-to-face teaching which in no way should be threatened by the development of online courses, and will eliminate the often emphasized risk of a deserted campus'[5].

According to Bédard, F and Pelletier P [6] learning must be active, collaborative and result-oriented. On the other hand, teaching is learner-centered. Hence, the learner is offered pedagogical modalities and activities in order to put forward production, and exchanges between peers. The transmission of knowledge on more specific content is then described and presented by the teacher.

Smith [7] argues that workload and time are mutually connected. The first hybrid course requires pedagogical redesign and support from technology specialists in order to better 'blend' face-to-face and distance learning while at the same time meeting the pedagogical needs of the course. Once this collaborative work with professionals or specialists has been carried out, the teacher can generally devote more time to research than to teaching.

Meunier [3] believes that it is essential that there is support for both the teacher and the learners. Whether in hybrid training or any other mode of teaching, the teacher must equip himself and be trained using various innovative tools. Whether through individual or collective training, the university has a role to play to encourage and support the academic staff. Similarly, learners need to be supported in order to get the most out of their learning.

Blended learning seems to be an excellent mix of face-to-face and distance learning that meets the needs of the teacher-learner relationship and the use of information and communication technologies [2]. It is learner-centered and offers more flexibility, but more work for the teacher at the beginning of the apprenticeship and more involvement of learners in the learning process in terms of behavioral change (way of learning, autonomy, reflective capacity and mutual aid) [8]. The academic staff has to rethink his/her teaching for more engaging content that will help the learners remember what they have learnt and enjoy studying [9]. While this takes time for the teacher and sometimes specific resources, it will gain time and experience in the long run [10].

Below is a global graphic scenario that groups the elements that are considered when mediating the course in hybrid mode.

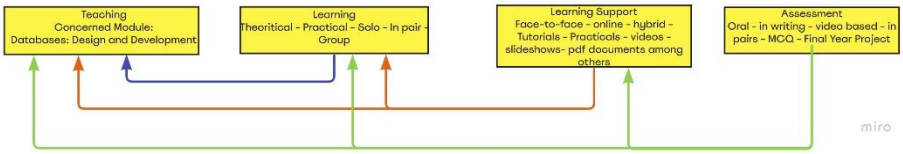

Fig. 1: General graphical scenario of the Databases: Design and Development course in hybrid mode: An illustration from Rodet: Recursive loops in the design process of ODL systems [11].

2.2 The Organization of Hybridization around Three Pillars

(1) Student autonomy; (2) continuous learning – regular repetition and (3) development of creativity.

Fig. 2: The 3 pillars of scriptwriting

2.2.1 The Development of Autonomy. Autonomy in students is developed through a classroom management system – by introducing a system that is based on a practical theory of William Glasser's Theory [12]. This theory is based on the common needs of all students. It is to have the freedom to work or even study alone, in pairs or in groups [13]. The idea is that each student is given responsibility in class. For example, he/she is responsible for creating the link between his/her friends and the trainer. He/she then takes a position in the school hierarchy. Thus, he/she has a real duty and real responsibilities. The pedagogical objective is therefore that the student understands the consequences and impacts of his/her actions.

2.2.2 The Permanence of Learning. What if the students created the exercises themselves? Indeed, the invention of exercises, lessons or even explanations via videos is done exclusively by academics, lecturers, and teachers [14]. However, during the permanence of learning, it is the students who correct, create the lessons and make a global assessment at the end. A study by Edgar Dale [15] proves that students learn better when they take action. Indeed, they retain 90% of the information in a presentation by creating it themselves, as opposed to 50% by only listening to it [16].

To deepen the development of autonomy of learning through the use of flipped classroom strategy, students learn the fundamentals on their own, at home, frequently using video content. They may learn at their own pace and grow accustomed to the self-study mode [17].

2.2.3 The Development of Creativity. In this pedagogical model it is the students who choose the tools he or she wishes to use to learn and transmit the course content [18] . Role-playing games, charades, riddles, constructions, mind mapping etc. In this way, they can share their knowledge with their peers in a fun way [19].

3 Literature Review

3.1 Medialization of Communication and Content

Mediatization refers to the format of the content (PDF, slide show, videos, etc.) facilitating access and understanding of the course in a homogeneous way that facilitates the application of the cognitive, socio-affective, motivational and metacognitive plan [20]. Thus, it can be said that the first distinction between one platform and another is mainly through the implementation of the intermediate system. Media reports must examine in depth the psychological aspects of users and learners [21]. According to Laurillard [22], the ideal teaching-learning process is a dialogue between the trainer and the student. For this dialogue to take place a framework is needed, and the design of the framework constitutes medialization. Thus, it can be said that the main difference between one platform and another is the system of medialization used [23]. If we talk about the online fields of intervention of tutors of Jacques Rodet [24], we can understand that the mediatisation of the pedagogical relationship is one of the components of the trainer's social environment (see Fig. 3). Moreover, mediatization is also mediation by external cognitive technological tools (in this case computer tools or computerized environments) [25]. Obviously, technology does not enable direct and immediate learning – i.e. learners are not here to learn from computers, books, videos or other tools, but this technology and its tools should be used to facilitate the process of knowledge development [26]. Sharon J. Derry described cognitive tools as psychological and computational devices that extend the user's thinking process [27]. For David H. Jonassen, cognitive tools are intelligent resources and learners can collaborate on cognitive knowledge through cognitive tools [28].

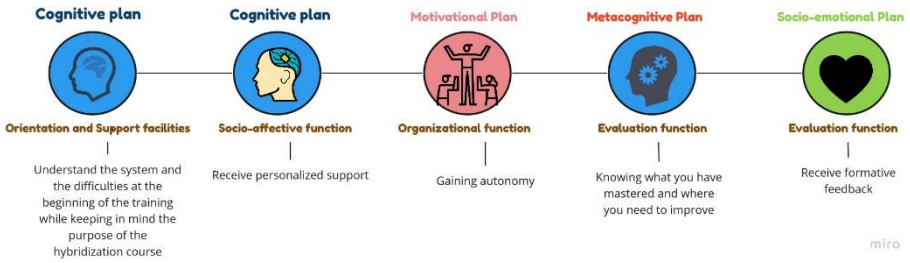

Fig. 3: The fields of intervention of tutors in distance learning by Jacques Rodet[29]

3.2 The Learning Strategy - Face-to-face Vs Online

It is important to remember that between fully face-to-face learning and fully online learning, there are several levels of integration of information and communication technologies (ICT) in educational practice [30]. This model of hybrid training is often measured in terms of the proportions between physical presence (face-to-face) and virtual presence (online) [31]. There are many examples of combinations, which explains the complexity of choosing a given formula to suit a given course for a given category of learners. As mentioned in the Commonwealth of Learning (COL) in blended learning courses, learners have learning activities to carry out at a distance, and other activities that take place on-site with the help of the lecturer [32]. AS elaborated by Mokhtar Ben Henda [33] finding the right 'mix' between the two types of activities is the subject of a typology of hybrid training courses that Serge Leblanc (University of Montpellier) has developed on the basis of supporting face-to-face training with digital distance processes: **(1) Face-to-face classes enriched by multimedia supports**: use in class by the trainer and/or the learners of the presentation tools or multimedia resources [34]. For example, use of slide shows, and use of resources from the Internet (online tutorials, online videos). **(2) Face-to-face enhanced by pre-session or inter-session work:** All lecturers/teachers and students have an e-mail address. Samuel Adu Gyamfi explains that before and after the course, the teacher provides students with a number of resources that they can access remotely [35]. **(3) Alternating face-to-face training:** Most of the training is face-to-face. As mentioned by Georgina Cooke, some distance learning is replaced by self-study activities, individual or group work [36].

4 Methodology

4.1 The Hybrid System, a New Perspective for a Renewed Pedagogy of Higher Education – The Hy-Sup Model

The Hy-sup project is part of the European Lifelong Programme. The hybrid system includes training courses which rely on digital environments (Learning Management System – LMS – for example Moodle). These LMS offer students resources to use and/or activities to carry out remotely and face-to-face (in the classrooms).

Extract from the Hy-Sup Report [37] indicates that the proportion of distance and face-to-face activities varies according to the system.

4.1.1 The Five (5) Dimensions of the Hybrid System under the Hy-Sup Model [38]. (a) Synchronisation of student face-to-face and online activities. The face-to-face/online relationship corresponds to the structural and persistent organization of the student's activities in the training system. This relationship tallies also to the balance between the two modalities according to the chosen pedagogical approach (the Hy-Sup model) and the types of activities implemented (group activities of the students - discussions, debates, role-playing, etc., and/or individual activities of the students - presentation, demonstration, assignments and reading program). **(b) Support provided to sustain the commitment of the students.** Tutoring through scenarios covers the support for learning that is put in place in the teaching and learning systems. It can take different forms: support for interaction and collaboration, organization and methodology, reflection and self-regulation. **(c) Mediatisation and accessibility of the resources.** Mediatisation is the process by which media are chosen in a rational way according to their specificities (pedagogical added value and limits), their appropriateness to the audience, the learning objectives targeted, and their integration into the teaching-learning system. It consists in providing students with tools to help them learn, produce and communicate, as well as a set of services and resources in multimedia format. **(d) Mediation.** Mediation corresponds to the effects of the media of the system on the behaviours and activities of the teachers and learners**. (e) Accessibility of the platform.** The flexibility of the training system on the e-learning platform corresponds to the degree of independence given to the student to organize his program.

4.1.2 The Two Configurations and the Predominant Conceptions of the Hy-Sup Model. Burton & al conducted an initial analysis conducted in 2011 [39] and identified six particular types of schemes divided into two configurations as observed and developed by Daniel Peraya & al in May 2021[39]: (1) Teaching focus configuration and (2) Learning focus configuration. Within each group, three different prevalent conceptions of what constitutes teaching and which also relate to the fourteen components of the hybrid system. Under the teaching focus configuration, there are the following approaches (1) transmissive teaching, (2) active teaching, (3) co-active teaching, [40]. While under learning-centered configuration the following methods prevail: (1) Learner Community Space for learning, (2) Designated and unrestricted space for learning and (3) mediatisation of all the functions of the learning system.

4.1.2.1 The Hy-Sup Typology - Teaching Focus Configurations. **Transmissive Teaching Approach (The Scene)**. The main role is the lecturer/teacher and he/she is the one responsible to design, create and disseminate the lessons that are focused on predetermined goals and presenting knowledge in a structured order [41]. The approach is mainly transmissive teaching where the tools to help learning and active face-to-face participation are favored [42]. The instructor maintains strict control over the knowledge that is communicated to students under the transmissive pedagogy model,

and students use some sort of standardized tests to show that they have learned the material [43]. **(2) Active Teaching Approach (The Screen).** Claire McGuinness explains that active learning approach encourages students to participate in their academic progress by analyzing, debating, researching, and producing [44]. In class, students use their skills and put their knowledge into practice, work through difficult decisions, focus on problem-solving issues, offer answers, and communicate concepts on their own terms through writing and discussion. The learning process depends on timely feedback from the teacher or other pupils. According to educational studies, including active learning techniques in university courses greatly improves students' learning outcomes [45] [46]. This learning approach is also characterized by (1) support from different multimedia resources and (2) the freedom of choice of the teaching methods. **(3) Co-active Teaching Approach (The Cockpit).** This type of teaching is oriented towards the organization of the course through the use of management tools and tending towards the integration of social and philosophical goals. The cockpit model leads individuals beyond of their comfort zones to make room for learning new lessons, putting concepts into reality using simple, readily understood frameworks, and emphasizing experiences that combine holistic learning. Co-active learning, according to Margaret E. Adam, is a method of interaction between a learning system and a human user in which both parties want to provide results that are as helpful to the user as feasible [47]. This approach primarily depends on three elements:(a) active face-to-face engagement;(b) freedom of choice in terms of instructional strategies; and (c) the engagement of outside resources and participants.

4.1.3.1 The Hy-Sup Typology - Learning Centered Configuration **(1) Learner Community Space for Learning (The Team).** This learning configuration is focused on supporting the knowledge-building processes and on interpersonal interactions [48]. Community-based learning refers to a wide range of educational strategies and initiatives that lecturers employ to link what is discussed in the classroom to the local institutions, historical and literary works, cultural traditions, and social environments [49]. The idea that all communities have inherent educational resources and assets that teachers may employ to improve learning experiences for students motivates community-based learning [50]. Learning Community Space for learning is frequently used as a more precise substitute for "classroom," although it may also be used to describe any interior or exterior space, actual or virtual [51]. Hence this learning approach which is assigned to the pedagogical ICT context is characterized by the following: (a) Learning support tools, (b) synchronous communication and collaboration tools, (c) multimedia type resources, and (d) reflective and relational goals. **(2) Open Space for Learning (OSL) (The Subway Type).** OSL, often known as open-space learning, is a pedagogical approach. OSL is a transdisciplinary pedagogy that relies on the utilization of physically open spaces, in which tables and chairs are not present, but an open attitude toward intellectual content and the function of the tutor is present [52]. OSL participants frequently, but not always, learn in an "embodied" manner [53]. OSL favors the freedom of choice of the learners in their learning path [54]. OSL is more geared towards the following methods: (a) active participation of students face-to-face and online; (b) use of management, communication and interaction tools, (c) methodological, metacognitive and peer support, (d) various choices of teaching methods and (e) intervention of experts in the related fields but who

do not belong to the academic world. **(3) Mediatisation of all the Functions of the Learning System (The Ecosystem).** This learning configuration is characterized by the exploitation of a large number of technological and pedagogical possibilities offered by hybrid systems as explained by Shaun Rawolle [55]. The mediatisation of all the functions of a hybrid training system is characterized by the following: (a) active student participation, (b) face-to-face, online, individual and group activities, (c) synchronous and asynchronous interaction and collaboration, (d) use of multimedia tools, (e) use of case-study based learning, (f) use of metacognitive and methodological methods, and (g) students' own way of commenting and annotating documents.

4.1.4 The 14 components of the Hybrid System – the Hy-Sup Model. Each of these components represents one of the dimensions of the initial descriptive model [56]. The initial typology defines each of the six types according to the relative distribution of the fourteen components identified by the statistical analysis.

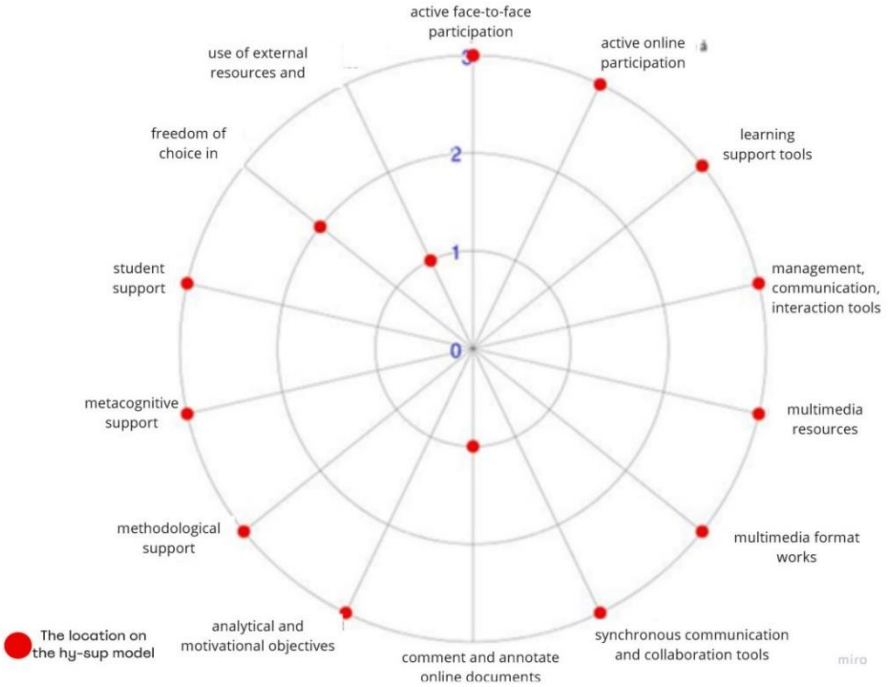

Fig. 4: The 14 components describing a hybrid device.

Component 1 - Active participation of students in face-to-face mode. This first component relates to the activities carried out by students during the face-to-face teaching phases [40]. This participation includes mainly group activities (discussions, debates, role-playing, projects, problem-solving, case studies, information research, simulations, peer tutoring, debriefings, regulation of activities, opportunities for

informal exchanges, contact and discussions) but also some individual activities (lectures, demonstrations, assignments and reading programs)[57].

Component 2 - Active participation of students online. This component relates to the frequency of activities carried out by students during the online learning phases [58]. It includes group activities (discussions, debates, role plays, projects, problem-solving, case studies, information retrieval, simulations, peer tutoring) but also individual activities such as reading programs.

Component 3 - Provision of learning support tools. This component relates to the frequency lecturers provide students with learning support tools in the techno-pedagogical environment[3]: for example, tools for tutoring and coaching, work resources (text and graphics editors, project management tools), workspaces and/or means to reflect on their learning habits (blog, logbook), indicators of activities progress, and other online open source tools to help students learn. Online group work with their peers is an opportunity to build their digital identity (introduce themselves, update their profile(s) [59].

Component 4 - Provision of management, communication and interaction tools. This component refers to the frequency with which teachers make management, communication and interaction tools available to students in the techno-pedagogical environment [60]. This includes spaces and/or means of communication, exchange and collaboration (forum) as well as means of management and organization (calendar, a reminder of upcoming activities and deadlines, grade managers etc.)[61].

Component 5 - Multimedia resources. This component relates to the frequency with which teachers make multimedia resources available to students in the techno-pedagogical environment, such as written documents incorporating numerous visual areas (tables, photos, diagrams, mathematical representations), static digital images (photographs, diagrams, maps, etc.), digital video documents and interactive software (animations, simulations, 3D universes, virtual or immersive worlds, augmented reality) [62]

Component 6 – Multimedia work format. This component is related to the frequency with which the teachers require the students to carry out their work in a multimedia form such as written documents integrating many visual ranges (tables, photos, diagrams, mathematical representations), digitized static images (photographs, diagrams, maps, ...), digital video documents[63].

Component 7 - Synchronous communication and collaboration tools used. This component relates to the regularity teachers propose the use of synchronous communication and collaboration tools [64]. These can be written synchronous communication tools (e.g. chat), oral synchronous communication tools (e.g. cell phone, conference call such as Big Blue Button, Ms Teams, Google Meet) as well as complex remote collaboration environments integrating sound, webcam, document and screen sharing, chat, shared whiteboard.

Component 8 - Possibility of commenting and annotating documents by students. This component indicates how often students have the possibility to comment and annotate the documents placed in the techno-pedagogical environment (digital resources and contents, logs, blogs or any other personal production made by their peers and/or lecturers [65].

Component 9 - Reflective and relational objectives. This component concerns teachers' perceptions of the techno-pedagogical environment and more specifically of its role in achieving reflective objectives (to know oneself better, to develop critical knowledge or methods, to develop one's self-confidence, to know better how one learns) and relational objectives (to create strong relationships through sociocognitive conflicts.) [18]. Sociocognitive conflict has the ability to encourage learning, cognitive growth, and healthy interpersonal relationships [66].

Component 10 - Methodological support by teachers. This component indicates the frequency with which the teacher (or his/her assistant) offers methodological support [67]. This support can, for example, be in the form of help with collaboration and exchanges between students (sharing of resources, group work). Moreover, the teacher can help groups of students to organize themselves, to divide tasks, to take decisions, to resolve conflicts, but also to encourage exchanges (introducing oneself, communicating opportunities and group projects.). These exchanges help to create personal contacts between a specific group of students and the lecturer(s).

Component 11 - Metacognitive support by teachers. This component indicates the frequency with which the teacher (or his/her assistant) offers metacognitive support [68]. The purpose of this type of support is to encourage the learner to reflect on his or her learning process and results (logbook, choice of strategies, etc.), to help students develop their own study methods, and to encourage the learner to reflect on his or her learning achievements.

Component 12 - Student Coaching. This component indicates the frequency students provide peer tutoring. This form of coaching consists, for example, of the exchange of information resources between peers (explanations, examples, reading lists, references, contact information for experts, etc.). It can also include the presentation of samples of previous courses, answers to questions asked by peers, encouragement to exchange ideas among peers, technical support in the use of course tools, taking charge of the organization of the group and the way it collaborates, resolving possible conflicts, and finally, presenting the work [69].

Component 13 - Choice of freedom of teaching methods. This component indicates the degree of freedom given to students in the choice of teaching methods used in the course [70]. It may concern, for example, the selection of possible paths within the training system, the formats of interaction, the way of learning, the resource persons to be solicited for support in learning and the technical means.

Component 14 - Provision of management, communication and interaction tools. This component relates to the frequency teachers make management tools,

communication and interaction tools available to students in the techno-pedagogical environment [71]. This includes spaces and/or means of communication, exchange and collaborative forums as well as means of organisation of their works (calendar, reminder of upcoming activities and deadlines).

5 Analysis and Findings

5.1 Behavioral Skills Used during the Class for Module Databases: Design and Development

When switching to virtual learning, it has been challenging to retain the same level of classroom management with a total of forty (40) students online. However, it is important to note that the same strategies employed in a physical classroom in a traditional university worked just as well online. The objectives and desired behaviors in the online classroom were kept simple and clear so that students understood exactly what were expected of them. This made it easier to establish the high degree of uniformity and equality. Flexibility was adopted since there were instances in which interpersonal interactions and students' welfare took precedence over finishing tasks and assignments. It was implied that the students were already familiar with the procedures, but making rules and expectations clear had helped prevent confusion or inappropriate behavior while encouraging teamwork, cooperation, and good conduct. Simple methods for setting expectations were used.

5.1.1 Behavioral Skills and Methods applied

5.1.1.1 Screen-Sharing Classroom Guidelines. The rules were referred to before each online class activity. The rules varied as expectations changed during the day. It was acceptable and decided to have many sets of rules as long as the students were aware of what each one was and when it would be enforced. The students had practice time to become acquainted to any new regulations, provide opportunity for discussion and modeling of the rules.

5.1.1.2 Get the Students Ready for Changes. A 10-minute notice was used, for instance, before switching from one activity to another: "In 10 minutes, it will be time to switch to practical." When there were five minutes remaining before the transition, students were given another warning, and then they were reminded once more. A pictorial timer was also used to make things even more understandable and to give the students time to psychologically prepare for the activity shift.

5.1.1.3 Use "When/Then" Clauses to make Expectations clearer. It was said to one student, for instance, "When you finish your Database case study, then you can take a 5-minute break." For larger groups dance style was used and that was a real success. Students understood that "When the class would finish the Entity Relationship Diagram assignment, then they would dance to a GoNoodle dance to shake up. It was important

to keep in mind that switching between studying and pleasant activities had kept motivation levels up.

5.1.1.4 The use of Forums and Discussions during the Online Course. Discussions forums were used in the online course to provide students the chance to engage with one another, the course material, and the lecturer. The online course's discussion forum had served as a communication tool for conversation. They started with a well-written post from the lecturer (see Fig. 5) and was organized along a message thread.
This online discussion forum (see Fig. 6) has been used for a variety of reasons, including helping students review information before one assignment, getting them involved in course discussion before the next class, and getting them to think about reading or working with content outside of class. Discussion forum was also used to help the students develop soft skills during the course. Soft skills like being cooperative, proper interaction with others, teamwork, stress management as well as effective completion of tasks and problems had helped the students be at their best. Additionally, discussion forums had enhanced the students' learning and had raised satisfaction levels within the course. Discussion boards had assisted in creating a feeling of community and social presence in the online classroom. Effective treatments were given during the duration of the discussion forums. Some students seized the opportunity well since they had the sense of responsibility and success in mind. While a few among them were just following the peers. Hence building connections, modifying the environment, controlling sensory stimulation, altering communication techniques, giving prompts and indications, employing a teach, review, and reteach method, and fostering social skills were among few examples of effective treatments used.

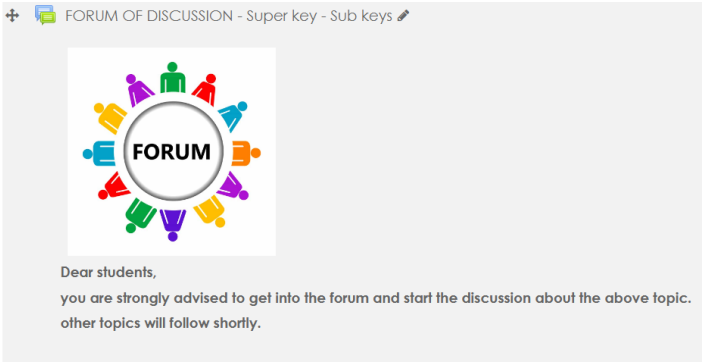

Fig. 5: Discussion Forum Announcement

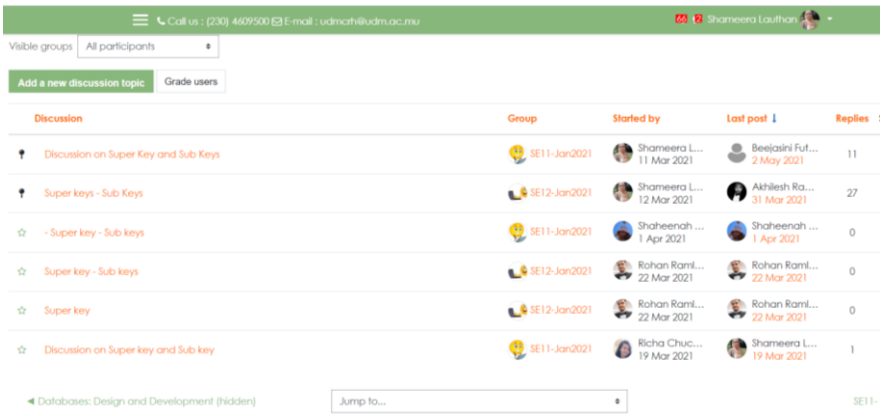

Fig. 6: The Discussion Forum

5.2 Routines Reliance

During these periods of new adaptability, change and uncertainty, it was extremely crucial to adhere to certain schedules and routines. The effort was made to provide the students as much structure and regularity. The topics and the elaboration of the notes were respected all through during the delivery of the course. Hence getting the students acquainted to the structure rapidly thus putting more effort on concentrating on the subject matter instead of refocusing on the arrangement of the learning platform. The organization of the online learning environment for the students was primordial. The 'Announcement' medium (see Fig. 7) was greatly used to encourage the students to complete their assignments, go over their daily plan(s).

Fig. 6a: The Chapters

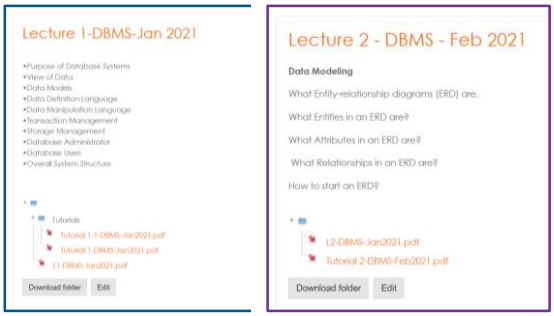

Fig. 6b: The Details about each Chapter and Self-Paced Tutorials

Fig. 7: Announcement Medium

5.3 Apply Appropriate Attention

Positive interactions had formed the foundation of proper relationships with the students. The various ways that had been used during the hybrid class was to focus the attention to encourage positive connections with the young adult students. As a caregiver and lecturer, the attention was a highly effective tool. The students received frequent, constructive individual attention from the lecturer. The way forward was to compliment them on their proper discussions, such as, "Very well explained!", "Another good answer!". Hence the students learnt that if they engaged in that conversation, they will receive the positive attention of the whole class online and the intervention of the lecturer. This shows how close the lecturer is with the students. The students thus feel that they are read and have been given proper attention. It was then observed that acknowledgement of the interaction by complimenting it right away had been praiseworthy.

5.4 Offer Options and Freedom

At times there were some resistance to participate in class or to upload the tutorials. This showed increased attempts at control from the young adults. This sense of independence manifested as a greater desire on the part of students to feel "in control" of their life. It had been rare during the delivery of this module but it was sensed that if the students were highly dictated, they would definitely loss their feeling of autonomy.

Giving the students options had been one approach put into practice. For instance, instead of forcing the students on a specific work: "You must do this normalization tutorial now". The other way round was to give the student a choice - "Would you want to begin with Part A or Part B of the worksheet? Or perhaps: "Would you want to complete the assignment on paper or on your laptop directly?" This had been a tactful technique to give them power while yet getting them to comply with the demands. The choices were limited to only two both of which the lecturer could adapt.

5.5 Boost Inspiration and Interest

The fundamental ideas employed to engage the students had largely remained the same, despite the fact that virtual classroom looked different. Hence a reward system based on classroom expectations and norms was set up. The used and tested methods for boosting the students were as follows:

5.5.1 Earning Points towards a Reward. A plan was made for how students would accumulate points toward a ‘virtual trophy’. They received virtual badges and trophies based on their active online participation. Their answers might be wrong. Still they

would receive a ‘participation badge’. If their answer is correct then they receive ‘participation badge’ and ‘a bonus of 5 stars’.

It was obvious which prizes the students would get. This created motivation for higher participation. Students were promptly given the rewards that were available online, which was the greatest method to provide them positive feedback for desired behavior. They would also showcase their rewards on their ‘virtual shelves’ to their peers. This would create self-motivation and inter-class motivation as well.

5.5.2 Description of Positive Behaviors. A list of rewards and privileges was created, such as the ability to submit one assignment one day later, be able to screen share and showcase their works and be privileged to choose from a list of titles of projects first. Admirable actions were described to the whole class. Hence students were more motivated, engaged and focused. The close relationship between the students and the lecturer was highly understood. There was no need to applaud the students explicitly. At times students turned on their video cameras and showed their works just to gain the trust of the lecturer if they were on the proper track. From that action, describing what was seen was to draw the attention to that positive conduct.

5.5.3 Power Development. Simple demands that students can easily met was made. From that they were then praised when they did. It was important to express proper appreciation for each discrete step taken, one at a time. Once power was gained, then more difficult instruction was issued. For instance, there were some students who repeatedly refused to finish algebraic expressions or normalization questions. As a first solution, the lecturer provided one or two clear instructions where agreement was likely: Thank you for starting the question and excellent job listening! "Please finish question 1 on the algebraic expressions". From those instructions mutual respect and compliance was gradually built on.

5.5.4 Give the Students Chances to Answer. The students’ attention, on-task conduct, and general engagement had improved rapidly and they were more engaged in verbal and nonverbal interaction. The students were amazingly reacting simultaneously in the virtual environment to express their agreement or disagreement with an answer in the chat room or by giving a thumbs-up, thumbs-down or an animated smiley emoji. These emoticons sent a sense of positive emotions to the whole class. Moreover, everyone in the class recorded their responses on their personal virtual whiteboard space and shared it up once they are done. Question on normalization was broken down into several parts and was made more explicit by the use of colors and highlights. Students then responded to various sections of the issue. This provided students with plenty of opportunity to answer and hence succeeded. Additionally, many remarkable possibilities were available for the lecturer to reinforce teaching and learning.

5.6 Use Powerful Commands.

Even though less directives were provided, the students were enthusiastic to follow them. The following guidelines were used to help students show willingness:

5.6.1 Set the Scene. Student liked to be valued. They felt more appreciated and understood why it was important to follow through when the context was explained properly to them. They also realized the reasoning behind why they were asked to accomplish the work in a limited time.

5.6.2 Inform Students of what to Do rather than just what not to Do. The concept of replacement of behaviors was used. Instead of merely taking something away, this made clear exactly what they had to do. And this way of doing things worked well with young adults. They set their own individual marker and knew perfectly what was expected from them.

5.6.3 Monitor Conforming Conduct. Appropriate feedback was effectively done. Students were encouraged to pay attention and reduce troublesome conduct. When instructions were followed by students, the observation made was to praise them such as, "Thank you for following my guidance right away." Even with young adults who have a tendency toward defiance, this behavior had reinforced their conduct and hence had encouraged increased obedience. Therefore, management of the online classroom was made enjoyable.

5.7 Demonstrate Eagerness and Adaptability

As soon as we resume classes for the particular semester, it was difficult to remember how vital it is to have fun since there were still so many uncertainties. However, the engagement with the students was here and it was natural to show excitement and delight. joking about, highlighting funny or absurd things, or simply just smiling when students were met in the morning online. Camera was asked to turn on for some 10 minutes and while engaged with a smiley emoticon added to that a smiling ‘Good morning’ students were more alert and already noticed that they would learn while having fun. This strategy has been adopted to decrease the burden of already being tired with online meets.

Often the day-to-day was unpredictable. But motivation continued to foster great relationships throughout the academic year. Examples were set for the students of how to successfully navigate difficult situations. Students were shown that it's not the end of the world, for instance, if they receive an unexpected schedule change by saying, "I know we just got this change in our schedule. That's a little nerve-wracking. Together, let's all take a few deep breathes". With that type of role-modeling, trust between students and the concerned lecturer was developed. This had greatly helped with interpersonal development of the students and had shown great improvement in the relationship with the students.

5.8 The Fitted Typology

The six (6) types of teaching and learning strategies were greatly elaborated. The concerned typology for the delivery of the course Databases: Design and Development (DDnD) was defined. DDnD was conducted in line with a hybrid system in different

sequences of delivering and with the help of the self-positioning tool made available on the site www.pedagosup.fr/carenn/. The following result was deduced after studying and analyzing the Hy-Sup models (the six types of configurations and their 14 components). The profile of the hybrid mode of delivery of the course DDnD corresponded to the 'Eco System' typology which is relatively accurate to the reality of the interventions of the module.

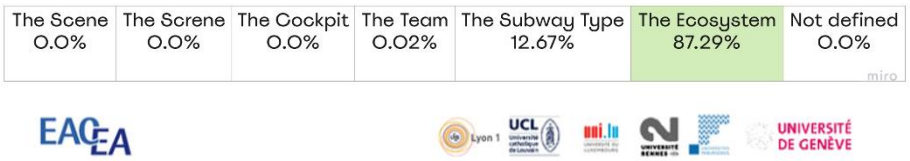

Fig. 8: Choice of typology with the self-positioning tool

5.9 The Type of Hybridization Selected and Integrated into a Teaching System to be Implemented in Hybrid Mode: The Eco System

The digital learning ecosystem is a whole chain of cultural vision, creative tools, image, support and services, structured data and evolution of the environment.
So based on the typology of the ecosystem which is a creative interaction, this evokes an environment in which each living object (learners and trainer) of the hybridization will evolve in synchronization and stability. In this perspective, the interaction and the richness of the exchanges constitute the conditions of the development and the continuity of the ecosystem. The ecosystem makes the most of all the technological and pedagogical dimensions offered by the hybrid strategies that will be exploited during the implementation of the hybridization:

a) The organization of face-to-face and distance learning activities based on active and participative teaching methods,
b) Methodological and metacognitive support for learners,
c) The mediation of all the constituent functions of a training mechanism and of resources coming from diversified strategies,
d) Explicit expectations in terms of relational and reflective mediation, and finally
e) The openness to resources and speakers from outside the course and the academic world, as well as the freedom of choice given to learners in their learning path.

In this respect, it can therefore be said that the ecosystem is the most complex configuration and even the richest from a techno-pedagogical point of view. Contrary to what has been seen in the configurations of the "teaching" group, no stone is left unturned. Even the freedom of choice is part of the pedagogical scenario. Obviously knowing how to organize oneself also form part of learning.

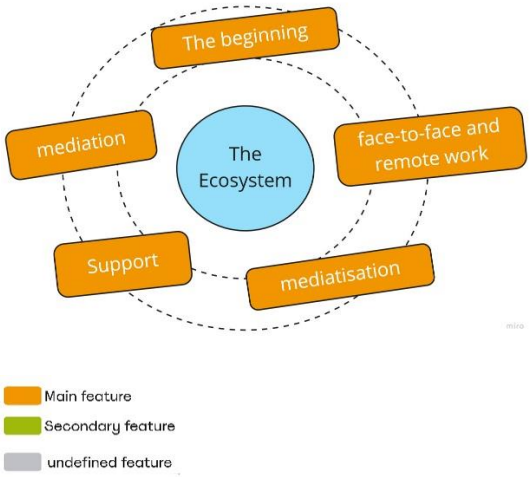

Fig. 9 : The Ecosystem – 87.29% (the hybrid class)

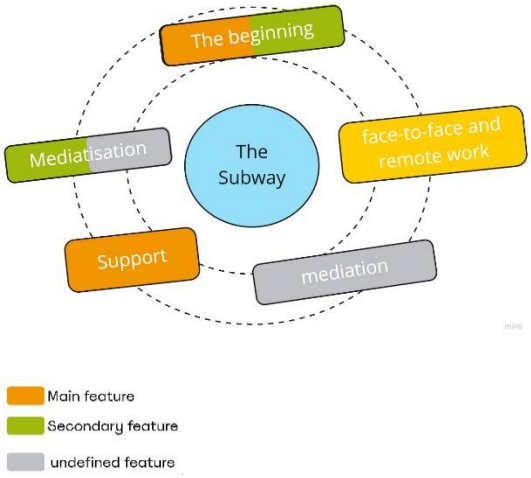

Fig. 10: Type 5 - The Subway – 12.67% (the hybrid class)

The chosen hybrid class is between a minimum of type 5 – the 'Subway' and the largely type 6 – the 'Ecosystem'. However, the 'Ecosystem' typology is largely favored because the latter determines more the way the hybrid class has been scripted and mediated.

6 Conclusion and Recommendation

6.1 The Eco System.

This system acted as a guide towards the hybridization of this pedagogical mediatization of the module Databases: Design and Development This modelling clearly shows how the different axes of type 6 – 'the ecosystem' are well integrated in the hybrid design. In these strategies, all the dimensions identified to characterize the hybrid design are elaborated:

- Active camera-ready virtual participation of the students;
- The frequent and diversified use of technological tools (whiteboard, MCQs, videos, chat, forums, discussion boards, whiteboards among others);
- Providing and encouraging the production of multimedia documents;
- Peer-to-peer interaction;
- The opening of the scheme to external resources and actors (relational workshops with private companies), etc.

Moreover, having implemented this type of framework, relational objectives are favored and the virtual work environment and its tools to facilitate the achievement of these objectives are focused on. Additionally, a particular emphasis will be put on the accompaniment of the students, in order to favor their learning.

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The Questionnaire

In order to continue to refine its configuration typology, the Hy-Sup team is interested in the following information. Thank you for your contribution.

Q1: At what level of study is the course taught?

- ❑Bachelor / Licence
- ❑Master
- ❑Doctorate
- ❑Continuing education
- ❑Other: ☐

Q2: How many students are enrolled in this course (estimate) *?

☐

Q3: How often are face-to-face teaching sessions held?

- ❑at regular intervals, every week
- ❑at regular intervals, at least 2 weeks apart
- ❑once at the beginning and once at the end of the course
- ❑ a series of face-to-face sessions followed by a completely remote phase
- ❑ Other: ☐

Required fields are indicated with *.

Regarding the face-to-face-online relationship:

	Often	Sometimes	Rarely	Never
You propose activities during the ONLINE teaching phases (outside the classroom).	☐	☐	☐	☐
You propose activities during the teaching phases FACE-TO-FACE (in the classroom).	☐	☐	☐	☐
You provide students with one or more tools to produce work (wiki, mind map editor, blog, logbook, etc.).	☐	☐	☐	☐
You provide students with one or more tools to produce assignments (wiki, concept map editor, blog, logbook, etc.).	☐	☐	☐	☐

You integrate images, photos, diagrams, maps, videos, etc. into the digital resources you offer.	☐	☐	☐	☐
In their work, students integrate images, photos, diagrams, maps, videos, etc.	☐	☐	☐	☐
You use SYNCHRONOUS communication and collaboration tools (chat, video conferencing, document and screen sharing, etc.).	☐	☐	☐	☐
Students can comment/edit the resources/documents made available to them and/or the work of their peers.	☐	☐	☐	☐
Your course is designed to help students learn to communicate, collaborate, and become more aware of their learning processes.	☐	☐	☐	☐
You provide methodological support (help with organization, time management, work methods)	☐	☐	☐	☐
You ask students to reflect on their knowledge and their learning process.	☐	☐	☐	☐
You stimulate mutual aid and support between students (answering questions from others, providing learning resources to others...).	☐	☐	☐	☐
Your course gives students a choice of learning activities, media and tools to use, methods, etc.	☐	☐	☐	☐
You involve outside resources or experts in your course.	☐	☐	☐	☐
Validation of the questionnaire: You will validate the answers given, you can always modify them by navigating with the arrows:	☐	☐	☐	☐
Validation				

The Validated Results

The Scene	The Screne	The Cockpit	The Team	The Subway Type	The Ecosystem	Not defined
0.0%	0.0%	0.0%	0.02%	12.67%	87.29%	0.0%

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