International Journal of Adult Education and Technology
Volume 15 • Issue 1

An Innovative Collaborative Approach to University Training for Learner-Teachers

Jamal Eddine Barhone, Abdelmalek Essaâdi University, Morocco*
https://orcid.org/0000-0002-7473-5021

Mohamed Erradi, Research Team in Computer Sciences and Educational Engineering, Abdelmalek Essaâdi University, Morocco
https://orcid.org/0009-0003-5507-1578

Mohamed Khaldi, Research Team in Computer Sciences and Educational Engineering, Abdelmalek Essaâdi University, Morocco
https://orcid.org/0000-0002-1593-1073

ABSTRACT

This paper reports on the experimentation of a collaborative learning approach in university training for a Master's degree in "Pedagogical and Multimedia Engineering". It is carried out with learner-teachers training in Instructional Design. The approach adopted focuses on the complexity of the collaborative situation, and is based on three andragogical models: shared cognition, self-directed learning and transformative learning. The aim of this study is twofold. On the one hand, to assess the relevance of a totally collaborative approach that fully integrates students into their learning. On the other hand, to design a collaborative model in the form of a grid that can be used to assess the collaborative potential of a learning situation. The indicators evoked by the collaborative groups in relation to each component of the model they developed reflect their level of appropriation of the model, and the impact of the approach on the development of skills for analyzing and designing learning situations.

KEYWORDS

Adult Collaborative Learning, Collaborative Approach, Collaborative Potential, Evaluation Model, Learning Situation

1. INTRODUCTION

The rapidly changing educational landscape, accentuated by the emergence of new technologies and the diversification of learning methods, is prompting educators to explore innovative approaches to improving the effectiveness of education. Among these approaches, collaborative learning stands out as a promising method, capitalizing on social interaction and the collective construction of knowledge. However, the current context of education is marked by a growing diversity of learners, changing expectations, and the ubiquitous integration of technology into the educational process.

DOI: 10.4018/IJAET.343313 *Corresponding Author

The challenges are manifold, ranging from the need to respond to diverse learning styles to preparing learners for active participation in an increasingly interconnected society. Over the years, numerous studies and research projects have demonstrated the enormous potential of collaboration in developing learners' ability to retain and reinforce the knowledge and skills they have acquired, in the collective construction of knowledge, in the development of a deep understanding of concepts, etc.

2. RESEARCH CONTEXT

The literature reveals numerous meta-analysis studies relating to collaborative learning. These studies aim to report on the different impacts of collaboration on the quality and processes of learning, on the development of cognitive and metacognitive skills, etc. In this respect, we cite the work of (Kyndt et al., 2013; Pai et al., 2015; Cherneiy et al., 2018; Chen et al., 2018).

More recently, Cindy and Heisawn, 2021 carried out a meta-analysis, which examined 700 articles on computer-assisted collaborative learning. The results of these analyses reveal the importance of interdisciplinarity in collaboration and the development of effective learning. In the same vein, Amparo et al., 2021 carried out a meta-analysis of 45 articles on collaborative learning from the Scopus, EBSCO, and Scielo databases between 2017 and 2021. The results of these analyses reveal that collaborative learning makes a significant contribution to the development of learning processes, improves interaction between learners, develops non-technical skills and critical thinking, and promotes values such as responsibility, solidarity, group work, shared cognition, etc.

Other studies have focused more specifically on the design and evaluation of pedagogical approaches and scenarios to be adopted to enable effective and optimized collaborative learning. In this article, we cite the work of (Chitiva, 2021, Molina et al., 2021, Vijayalakshmi & Kanchana, 2020 and Marij et al., 2020), which highlight the importance and effectiveness of collaborative approaches based on problem situations, complex tasks, or collective productions in creating rich and effective collaborative learning experiences.

In their study, Nathalie et al. 2020 described a theoretical model for implementing the collaborative approach in higher education using Mezirow's theory of transformative learning. Boating, 2022, for his part, relied on the notion of directed self-learning to set up a didactic approach integrating the collaborative approach by using modern technologies in adult education.

On the question of assessment applied to collaborative learning, most studies have focused on assessing the influence of psychological factors on the development of collaborative learning using subjective measurement techniques (Abuhasna et al., 2020), peer evaluations (Yokoyama & Miwa, 2021), rating grids (Swan et al., 2008), checklists of complex task indicators (Lee & Osman, 2021), multiple choice questions (Bermert et al., 2020), semi-directed interviews (Cheng, 2021), and questionnaires (Ghaviferk, 2020).

Borge et al. 2019 used the analysis of collaborative scripts to conclude the resources of shared cognition in the collaborative group. Other researchers have used collaborative learning analysis techniques such as the analysis of written traces and social interactions to deduce emerging models of collaboration and the feedback to be put in place (Reiman et al., 2020). Dillenbourg & Hong, 2020 use a large-scale approach to examine the subtleties of collaborative learning in various disciplinary contexts. While Pijiera-Diaz & Suthers, 2020 analyzed the semantic networks generated by collaborative groups during group problem-solving.

All studies on collaborative learning recognize the importance of the learning situation and the learning tasks to be carried out in designing effective collaborative learning scenarios. However, the analysis and evaluation of collaborative potential (in terms of knowledge, know-how, and interpersonal skills) have not received the same attention from research in the educational sciences, cognitive psychology, or computer environment technologies.

Moreover, not all learning situations necessarily require a collaborative approach, as Summers & Volet, 2010 point out, and the choice between individual and collaborative learning depends largely on

the specific nature of the task to be carried out, the learning objectives, and the learners' preferences. All the more reason for the situation that the object of collaborative learning to be analyzed and examined in depth before it is implemented in any teaching approach.

Knowing that any learning situation, especially when it is complex and stimulating, carries a set of knowledge and procedures and can generate different cognitive and metacognitive processes. Furthermore, the data resulting from the analysis of the collaborative potential of the situation could be of great pedagogical use insofar as these data can inform designers on the best pedagogical scenarios for effective collaborative learning experiences, in particular the management and in-depth evaluation of the learning acquired, developed and shared, and the feedback to be provided.

In this context, our study is part of this perspective of analyzing the collaborative potential of a learning situation described as collaborative, seeking to answer several crucial questions: Are the different collaborative groups capable of devising a collective model to help assess the collaborative potential of a learning situation? Are the different collaborative groups capable of applying the evaluation model they have developed to assess the collaborative quality of a situation imposed by the teacher? Are the different collaborative groups able to apply the assessment model to design a collaborative learning situation of their choice? Does the approach adopted have the same impact and effectiveness for the different groups in our sample?

The main aim of this research is twofold. On the one hand, to present a collaborative approach that fully integrates learner-teachers into their learning. On the other hand, to design a tool in the form of a grid that can be used to assess the collaborative potential of a learning situation.

This article is structured to provide a holistic view of the experiment. We begin with a review of the theoretical foundations of collaborative learning, before diving into the methodology of the study, the results observed, and a discussion of the implications of our findings.

3. THEORETICAL FRAMEWORK

The theoretical foundations of collaborative learning are based on conceptual frameworks drawn from several educational theories. In this article, we cite the key theories underpinning collaborative learning:

Constructivism, which asserts that knowledge is constructed by the learner through interactions with their environment. However, in the collaborative context, learners actively construct their understanding by interacting with their peers, sharing ideas, and solving problems together.

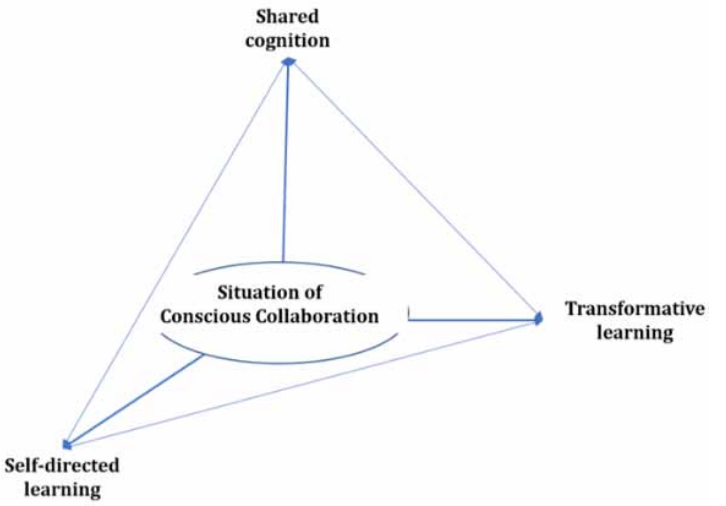
Social constructivism, which emphasizes the importance of social interaction in the process of constructing knowledge, taking into account Vygotsky's theory of the Proximal Zone of Development (PZD), which suggests that learning is most effective when it takes place in the zone between what the learner can do on their own and what they can do with the help of a more competent peer. However, collaborative learning is rooted in this perspective, promoting the co-construction of knowledge through shared discussions and activities and encouraging peer-to-peer interactions to support learners in their PZD.

Situated Learning theory, which postulates that knowledge is better understood and retained when it is anchored in meaningful contexts. However, collaborative learning often favors activities situated in authentic contexts, thus reinforcing understanding of the content.

Experiential learning, an approach that emphasizes learning through experience and interaction. Indeed, collaborative activities offer learners interactive experiences that go beyond the simple reception of information (Balleux, 2000).

Cognitive interactivity theory, which emphasizes the importance of cognitive interaction, where learners engage in discussions and activities that stimulate their critical thinking and problem-solving (Jonassen, 1995).

Figure 1. The model supports the approach adopted



The theory of social cooperation, which highlights the benefits of social cooperation in learning, with researchers emphasizing that cooperation, rather than competition, foster a positive climate for learning (Johnson & Johnson, 1975).

Computer Supported Collaborative Learning (CSCL) theory is a specific branch of collaborative learning that explores how technology can facilitate online collaboration. It draws on concepts such

As online social presence and the collective construction of knowledge through digital platforms (Moore, 2019; Bengochea, 2021).

Distributed Learning theory, which considers that knowledge and learning are not limited to individuals, but are distributed through social interactions and cultural artifacts. However, collaborative learning is part of this distributed perspective of cognition (Molinari et al., 2021).

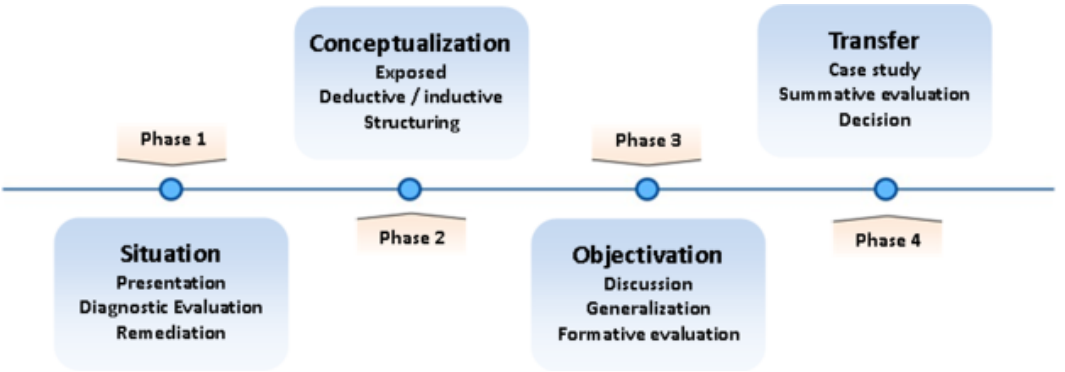
The theory of self-directed learning has its roots in the thinking of Dewey. In the second half of the twentieth century, this theory gradually gained ground in the field of adult education, starting with the seminal work of Rogers (1969), Tough (1971), and Knowles (1975). Knowles defines self-directed learning as "a process in which individuals take the initiative, with or without the help of others, in determining their training needs, in identifying the human and material resources required for training, in selecting and implementing appropriate training strategies, and in evaluating the results of their training.

Mezirow's notion of transformative learning is now a benchmark in the field of adult education. Mezirow has defined the concept of Transformative Learning as "the process of using a prior interpretation to construct a new or revisited interpretation of the meaning of one's experience as a guide to future action" (Mezirow, 2000). He believes that learning is truly transformative if, by going beyond the instrumental or communicative exchange level, it produces a form of liberating emancipation in the adult.

In conclusion, by combining these theoretical perspectives, collaborative learning offers a powerful framework for the construction of knowledge, the active engagement of learners, and the development of social and cognitive skills. These theoretical foundations guide the design and implementation of collaborative activities in various educational contexts.

Given that we are dealing with adult education, our training approach is based on a mixed andragogical model centered on the nature of the situation (complex task) and founded on the exploitation of the potential of self-directed learning to generate a conscious sharing of cognition to make collaborative learning transformable in different situations. The following figure illustrates

Figure 2. Example of the life cycle of a teaching scenario for a learning situation



the model based on the approach adopted, which enables each component to call on the other in a process of reflective learning and conscious skills.

Based on our previous work (Khaldi et al., 2021; 2020). Whereas a learning situation in an e-learning module corresponds to learning activities. The following figure illustrates an example of the life cycle of a pedagogical scenario for a learning situation.

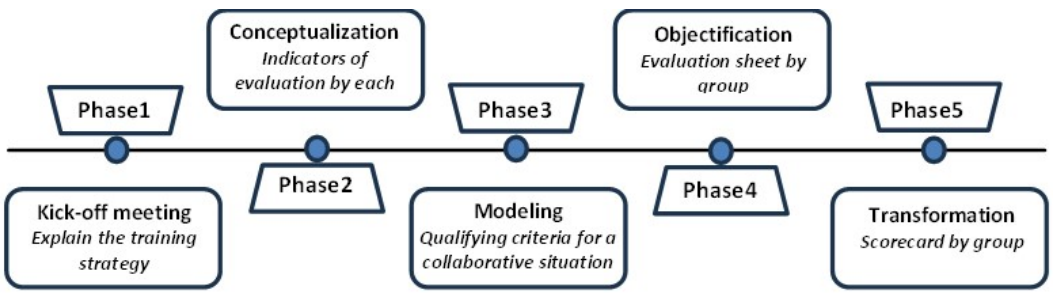
In this article, we propose the life cycle of a pedagogical scenario for the implementation of the collaborative learning model, which is made up of five stages. The following figure illustrates the model.

4. METHODOLOGY

This experiment is being carried out with 84 learner-teachers studying for a master's degree in Multimedia Pedagogical Engineering at the Ecole Normale Supérieure Tétouan (Abdelmalek Essaadi University, Morocco). One of the main aims of this Master's program is to train people to design, analyze, develop, and evaluate distance learning and e-Learning systems, using the approaches, methods, techniques, and tools of pedagogical and adult education engineering.

All the participants are practicing teachers with over ten years' experience of in teaching. The experiment therefore reflects the training strategy adopted in the teaching of one of the modules in this master's degree, which is "educational design". Most of the training in this module is geared towards group work and production. The participants are therefore familiar with collaborative work, especially as the profile sought is that of a professional in the field.

Figure 3. Example of the lifecycle of an educational scenario implementing the collaborative learning model



However, referring to the model of the training approach adopted, the first phase concerns the kick-off meeting, the aim of which is to explain the training strategy, the approach and scenario adopted, and the expectations of the training. This phase was carried out face-to-face, in fact, after stating the objectives of the research through a presentation, the teacher opened a discussion to answer the questions asked and clarify any points that were not well understood.

The second phase involved conceptualization, the aim of which was to identify and analyze as many evaluation indicators as possible, based on the reading and analysis of 12 research articles on collaborative learning. However, the task to be carried out by each group is to form an overall picture of what collaborative learning is and to deduce from the different articles the different criteria that can qualify a learning situation as "collaborative". Each group, using the techniques already studied, leads discussions around the indicators that can be associated with each criterion for characterizing the collaborative situation. It should be noted that the composition of the different groups (4 learner-teachers per group) is freely distributed according to the preferences of the learner-teachers, which means that there are 21 groups in total.

The different results obtained are collected by the teacher and grouped in the form of criteria. The following table shows the different criteria taken into consideration.

After establishing the table of qualitative criteria for a collaborative situation, the teacher asked the different groups to analyze and then assign a degree of agreement from 0 to 4 on the importance of the criterion in the collaborative situation based on the following rule: (0: totally disagree; 1: disagree; 2: indifferent; 3: agree; 4: strongly agree).

Question 1: Are the participants capable of designing a collective model to help design or evaluate a collaborative situation?

In the modelling phase, the aim is to develop the final model selected by all the groups. The different groups are then asked to apply the chosen model in assessing the collaborative quality of a learning situation proposed by the teacher and which concerns "the collaborative scripting of an online multimedia course and the production of the associated model". Such a situation is complex because it involves multiple aspects of pedagogy, didactics and computer environment technologies, etc. The task of each group is to analyse the situation in depth and to demonstrate understanding of each criterion by evoking concrete indicators.

Table 1. Qualitative criteria of a collaborative situation

Criteria
C1: The situation contains a shared goal
C2: The situation is complex
C3: The situation generates a socio-cognitive conflict
C4: The situation concerns necessary training needs.
C5: The situation generates new knowledge
C6: The situation invites metacognition
C7: The situation motivates active engagement
C8: The situation allows the development of the ZCD zone
Others: (easy, didactic, precise, problem, reflexivity, metacognitive objectives, creative, etc.)

Question 2: Are the participants capable of applying the validation model developed by themselves to assess the collaborative quality of a situation imposed by the teacher?

In the transformation phase, which concerns the transfer of skills, the aim is to assess each group's ability to apply the model to the situation of its choice. The task is to propose a scoreboard for each group, where each group applies the model in the same way as before, to analyze the collaborative potential of a situation of its choice and in the area of its preferences.

At the end of the transformation phase, which concerns the transfer of skills, we asked a third question, the results of which we will discuss in the "results and discussion" section:

Question 3: Are the participants able to apply the evaluation model to analyze the collaborative potential of a collaborative learning situation of their choice?

In each situation, the different groups of teachers are asked to analyze the situation based on the criteria in the evaluation model, and consequently to give indicators or concrete evidence to enhance each criterion in the model. A score is awarded by the module teacher for each criterion:

1: No indicator or evidence
2: Indicator not specified using a concrete example
3: Indicator or evidence specified using a concrete example
4: More than one indicator specified

An example of the responses from the collaborative groups is given in the appendix. To analyze the data, we used descriptive statistics to report the average level of each group, and Levene's test to report the significance of the differences in the observations obtained between the different groups.

5. RESULTS AND DISCUSSION

5.1. Modeling Phase

Question 1: Are the learner-teachers capable of devising a collective model for analyzing and evaluating the collaborative potential of a learning situation?

After reading and analyzing the various resources made available to them, all the learner-teachers were able to identify several criteria that could characterize a collaborative situation. Table 2 shows the eight headings or quality criteria for the collaborative situation that were accepted by the entire population.

These criteria were given the same importance and therefore the same weight in the model (α # 0.8). All groups agreed on the 8 criteria C1 to C8 ($3 < x < 4$; $\sigma 2 < 0.15$). For all learners, all criteria indicated the collaborative potential of a learning situation. In other words, a learning situation that encourages or brings out these different components can generate effective, productive or transformative collaborative learning.

Note that:

Cronbach's Alpha = 0.838 (number of items 8)
Cronbach's Alpha based on standardised items:0.855
α: Cronbach's alpha with item removal

5.2. Application and Objectification Phase

Question 2: Are the participants able to apply the evaluation or analysis model they have developed themselves to account for the collaborative potential of a situation imposed by the teacher?

Using the evaluation or analysis grids produced by each collaborative group, and after the module teacher has assigned a score between 1 and 4 to each criterion (C1 to C8), according to the scale presented earlier, the average score obtained by each group in relation to the eight criteria (xG) is calculated. We then determine x, the average score obtained by all the groups for all the criteria ($x = \sum x_G / 22$).

To avoid overloading the data, Table 3 shows the minimum average score (Min) and the maximum average score (Max).

The results show that, on average, the support indicators mentioned by all the groups are satisfied (x=3.150), which shows that the different groups, on average, manage to give at least one concrete proof for each criterion. However, the high value of the variance (σ^2=0.651) shows that the teachers found it difficult to illustrate certain criteria using precise indicators. This was the case for criteria C6 (the situation promotes metacognition) and C8 (the situation helps develop the proximal zone), which obtained low satisfaction scores (one degree below 2).

The single-factor variance homogeneity test shows that the differences observed between the different groups are not statistically significant ($F(21, 8) = 1.013 < fc$ (critical value) = 1.650; sig=0.045). The homogeneity of the differences in the small groups of teachers shows that they generally adopt the same behavior when faced with the situation, which is also part of their daily teaching and learning. Future teachers are used to designing learning activities in "group work" mode, but not in an educational engineering context, which requires an in-depth analysis of both learning needs and the scope of the learning situation, necessitating very careful planning of the learning.

5.3. Skills Transfer Phase

Question 3: Are the participants able to apply the evaluation model to analyze the collaborative potential of a collaborative learning situation of their choice?

The results obtained (Table 4) show a clear improvement in the scores obtained compared with the application of the model in an imposed situation. The minimum average level of satisfaction rose

Table 3. Scores obtained and comparison of the averages obtained by the different groups

	Descriptive statistics					Variance homogeneity test				
	Min	Max	x	σ	σ^2	N	dll	F	sig	fc
Situation 1	2.630	3.500	3.150	0.226	0.651	21	20	1.013	0.045	1.650

Table 4. Scores obtained by the different groups in the application of the model to the analysis of the collaborative potential of the free choice situation

	Descriptive statistics					Variance homogeneity test				
	Min	Max	x	σ	σ^2	N	dll	F	sig	fc
Situation 2	3.130	3.880	3.583	0.210	0.044	21	20	1.542	0.075	1.650

from Min = 2.630 (situation 1) to Min = 3.130 (situation 2). The maximum level of satisfaction rose from Max = 3,500 (situation 1) to Max = 3,880 (situation 2). As a result, the average satisfaction score rose from x = 3.150 to x = 3.583). The differences in scores between the groups were not significant (F(21, 8) = 1.542 < fc = 1.650).

All the choices made by the groups of learner-teachers concerned complex disciplinary tasks (computing, mathematics, physical sciences, and languages). All the groups in our study population preferred to work on situations arising from their teaching practice, which we believe facilitated the transfer of the skills developed. The results show a high level of awareness among the learner-teachers of the collaborative quality of the learning situations chosen.

The differences in scores between the groups, which were not significant, lead us to believe that the approach adopted was relevant and usable at the same level by all the learner-teachers who took part in this experiment with the collaborative approach.

However, the transfer of skills to other preferred situations was facilitated by the choice of a situation directly linked to the learners' everyday practices. The results of the comparison of the scores (table 5) obtained in situation 1 and situation 2 show a slight but statistically significant difference in favor of situation 2 (F (20; 8) = 1.872 > fc (critical value).

Using a self-developed assessment model in a collaborative context means that it can be appropriated and applied in a meaningful and formative way in engaging and stimulating situations. The collaborative work also enabled the learner-teachers to better understand and assimilate certain key concepts from the cognitive sciences, such as socio-cognitive conflict, metacognition, the proximity zone, etc.

6. CONCLUSION

The conclusions drawn from this experiment make it possible to emphasize that the collaborative approach adopted in the training of learner-teachers in instructional design, based on a pedagogical approach cantered on groups of learners and piloted by themselves, has a positive and significant impact on the development of skills in the design of collaborative learning situations and the analysis and evaluation of their collaborative potential.

We believe that placing learner-teachers in a learning situation that is both part of their everyday teaching practice and part of an instructional engineering perspective leads to strong engagement, self-direction, and a significant transfer of learning. The approach adopted made it possible to achieve the objectives set, i.e., the ability to develop an assessment model and apply it consciously in different situations.

Situated in the context of educational engineering, and about an eminent need for designers of e-learning experiences, the analysis of the cognitive, metacognitive, communicative, and social impact of a learning situation provides important data for educational designers, particularly when it comes to steering, evaluating or even anticipating distance learning processes.

Table 5. Comparison of the satisfaction scores obtained by all the groups of teachers between the imposed situation (situation 1) and the preferred situation (situation 2)

	x	σ^2	N	dll	F	sig	fc
Situation 1	3.150	0.651	21	20	1.872	0.1	1.63
Situation 2	3.583	0.044					

CONFLICTS OF INTEREST

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

FUNDING STATEMENT

No funding was received for this work.

CORRESPONDING AUTHOR

Correspondence should be addressed to Jamal Eddine Barhone (barhone.j.e@gmail.com).

PROCESS DATES

Received: 2/26/2024, Revisions: 3/19/2024, Accepted 3/19/2024

REFERENCES

Abuhassna, H., Al-Rahmi, W. M., Yahya, N., Zakaria, M. A. Z. M., Kosnin, A. B. M., & Darwish, M. (2020). Development of a new model on utilizing online learning platforms to improve students' academic achievements and satisfaction. *International Journal of Educational Technology in Higher Education*, *17*(1), 38. doi:10.1186/s41239-020-00216-z

Amparo, R. M.-S., Meluzka, J. G.-R., Carmelo, L. F.-M., Mendz, J. V., & Flores, E. (2021). Collaborative learning an active methodology in long-distance education. *Theoretical Review*. *National Volatiles & Essential Oils*, *8*(4), 2443–2457.

Balleux, A. (2000). Évolution de la notion d'apprentissage expérientiel en éducation des adultes: Vingt-cinq ans de recherche. *Revue des Sciences de l'Education*, *26*(2), 263–286. doi:10.7202/000123ar

Bengochea, G. R., Piccirilli, M. P., & León, G. (2021). Emergent universe revisited through the CSL theory. *The European Physical Journal C*, *81*(12), 10–49. doi:10.1140/epjc/s10052-021-09842-x

Boating, J. K. (2022). Influence of adult learners' self–direction on group learning. *Cogent Social Sciences*, *8*(1), 206–4592. doi:10.1080/23311886.2022.2064592

Borge, M., Håland, E., Solli, A., & Hadjerrouit, S. (2019). L'impact des scripts collaboratifs sur l'apprentissage collaboratif en réalité virtuelle. *Informatique et éducation, 128*, 294-309.

Bremert, H., Stoff, A., & Boesdorfer, S. B. (2020). Collaborative and assessment: Learning science and collaborative skills during summative testing. *Science Teacher (Normal, Ill.)*, *87*(9), 9.

Chen, J., Kirschner, P. A., Wang, M., & Tsai, C. C. (1918). The role of collaboration, computer use, learning environments, and supporting strategies in CSCL: A meta-analysis. *Review of Educational Research*, *XX*(X), 1–45. doi:10.3102/0034654318791584

Cheng, F. F., Wu, C.-S., & Cheng Su, P.-C. (2021). The impact of collaborative learning and personality on satisfaction in innovative teaching context. *Frontiers in Psychology*, *12*, 713–497. doi:10.3389/fpsyg.2021.713497 PMID:34659026

Cherney, M. R., Fetherston, M., & Johnsen, L. J. (2018). Online course student collaboration literature: A review and critique. *Small Group Research*, *49*(1), 98–128. doi:10.1177/1046496417721627

Chitiva, M.D.P. (2021). Aprendizaje colaborativo, mediado por internet, en procesos de educación superior. *Revista electrónica educare, 25(2),* 1-19. *https://doi.org/.*10.15359/ree.25-23

Cindy, H.-S., & Heisawn, J. (2021). Benefits and Challenges of Interdisciplinarity in CSCL Research: A View from the Literature. *Frontiers in Psychology*, *11*, 10. 3389/fpsyg.2020.579986 PMID:33519598

Dillenbourg, P., & Hong, F. (2020). La mécanique de la collaboration entre expertises: une étude à grande échelle dans l'enseignement supérieur. *Journal international d'apprentissage collaboratif assisté par ordinateur, 15*(4), 395-428.

Ghavifekr, S. (2020). Collaborative learning: A key to enhance students' social interaction skills. *Malaysian Online Journal of Educational Sciences, 8*(4).

Johnson, D. W., & Johnson, R. T. (1975). *Learning together and alone: Cooperation, competition and individualization*. Prentice-Hall.

Jonassen, D. H. (1995). *Operationalizing mental models: Strategies for assessing mental models to support meaningful learning and design-supportive learning environments*. Http://www-cscl95/ indiana.edu/cscl95/ jonassen.html

Khaldi, M., Barhoune, J.E., Erradi, M., & Khaldi,M. (2020). The educational scenario architecture of a learning situation. *Global Journal of Engineering and Technology Advances, 3*(1), 027-040.

Khaldi,M., Erradi,O., Erradi,M., & Khaldi. (2021). Design of educational scenarios of activities in a learning situation for online teaching. *GSC Advanced Engineering and Technology, 1*(1), 049-064.

Knowles, M. (1975). *Self-directed learning: A guide for learners and teachers*. Follett Publishing Company.

Kyndt, E., Raes, E., Lismont, B., Timmers, F., Cascallar, E., & Dochy, F. (2013). A meta-analysis of the effects of face-to-face cooperative learning. Do recent studies falsify or verify earlier findings? *Educational Research Review*, *10*, 133–149. doi:10.1016/j.edurev.2013.02.002

Lee, J., & Osman, G. (2021). Students' experiences and perceptions of online collaborative learning in higher education of Korea and Uae. *Turkish Online Journal of Distance Education-TOJDE. January, 22,* 1.

Marij, V., Kuijk, M., Doolaard, S., & Bosker, R. (2020). The proof of the pudding is in the eating? Implementation of cooperative learning: Differences in teachers' attitudes and beliefs. *Teachers and Teaching*, *26*(1), 1–15. do i:10.1080/13540602.2020.1740197

Mezirow, J. (2000). Learning to think like an adult. In J. Mezirow (Ed.), *Learning as transformation* (pp. 3–34). Jossey-Bass.

Molina, A., Gonzalez, M.I., & Martinez, H. A. (2021). ercepción del profesorado de Educación Física sobre el Aprendizaje Cooperativo y su relación con la Inteligencia Emocional Physical Education teacheŕ s perception of Cooperative Learning and itsrelation to Emotional Intelligence. *Retos, 41,* (3ºtrimestre).

Molinari, G., Muller Mirza, N., & Tartas, V. (2021). Regards croisés des approches cognitives et socioculturelles sur l'apprentissage collaboratif: quelles contributions dans le domaine de l'éducation ?. *Raisons éducatives, 25*, 41-64. 10.3917/raised.025.0041

Moore, J. (2019). Collaboration online: Sloan-C resources. *Online Learning : the Official Journal of the Online Learning Consortium*, *10*(1), 10. doi:10.24059/olj.v10i1.1773

Natalie, D., Natalie, B., Thuy, B., Li, Y., Melincavage, S., & Wang, X. (2022). A transformative approach to collaborative learning for higher education. *The International Journal of Learning in Higher Education*, *29*(2), 189–205. doi:10.18848/2327-7955/CGP/v29i02/189-205

Pai, H.-H., Sears, D., & Maeda, Y. (2015). Effects of small-group learning on transfer: A meta-analysis. *Educational Psychology Review*, *27*(1), 10. doi:10.1007/s10648-014-9260-8

Pijeira-Díaz, H.J., & Suthers, D.D. (2020). Évaluation de la cognition de groupe dans la résolution collaborative de problèmes à l'aide de l'analyse de réseau épistémique. *Journal international d'apprentissage collaboratif assisté par ordinateur, 15*(2), 197-230.

Reimann, P., Rummel, N., & Suthers, D. (2020). Learning Analytics pour une prise en charge avancée de l'apprentissage collaboratif. *Journal of Learning Analytics*, *7*(1), 1–8.

Rogers, C. (1969). Freedom to learn. Charles E. Merrill.

Summer, M., & Volet, S. (2010). Group work does not necessarily equal collaborative learning evidence from observations ans self-reports. *European Journal of Psychology of Education*, *25*(4), 473–492. https://www.jstor.org/stable/23421483. doi:10.1007/s10212-010-0026-5

Swan, K., Jia, S., & Hiltz, S. (2008). Assessment and collaboration in online learning. *Journal of Asynchronous Learning Networks*, *10*, 10. 24059/olj.v10i1.1770

Tough, A. (1979). *The adult's learning projects: A fresh approach to theory and practice in adult learning* (2nd ed.). Ontario Institute for Studies in Education.

Vijayalakshmi, D., & Kanchana, J. (2020). Evaluating the effectiveness of the collaborative learning in fashion studies. 9th World Engineering Education Forum, WEEF 2019. *ScienceDirect. Procedia Computer Science*, *172*, 991–1000.

Yokoyama, M., & Miwa, K. A. (2021). Class practice study of intervention effect of interactive assessment on learning goal orientation. *Frontiers in Psychology*, *12*, 599480. doi:10.3389/fpsyg.2021.599480 PMID:34456778

APPENDIX

Table 6. Quality criteria

Quality criteria	Indicators or evidence examples
C1: The situation contains a shared goal	■ As teachers, we all need to develop our skills in assessing and analysing learning situations. ■ Learn to design subjective assessment grids. ■ The assessment at the end of the module will focus on the design of collaborative situations. ■ We can't wait to put our skills to the test
C2: The situation is complex	■ Scripting an online multimedia course involves several fields: cognitive science, didactics, pedagogy, IT technology, multimedia, management, etc. ■ The situation calls on several models: instructional design models, learning models, teaching models, etc. ■ The situation suggests complex tasks: Educational alignment; adaptation; integration into a platform, etc. ■ The situation requires multiple skills in the pedagogical engineering of e-learning systems
C3: The situation generates a socio-cognitive conflict	■ The situation calls on a range of knowledge about which we do not have the same ideas or representations: the notions of learning objectives, assessment objectives, and skills; the relationship between objectives and skills. ■ Confusions between instructional design models, learning models, and teaching models. ■ Confusions between didactic approaches and methods
C4: The situation relates to training needs.	■ The situation fits in perfectly with our day-to-day teaching practices: lesson preparation and implementation. ■ The situation is relevant to our distance learning issues during Covid 19 ■ The situation is authentic in the context of the profile of the instructional designer that we are seeking to develop. ■ The situation conveys a set of cognitive and metacognitive skills that we need to improve our teaching: needs analysis, design and modeling, scripting and mediatization, development and implementation, e-learning platforms, etc.
C5: The situation generates new knowledge	■ The situation conveys a body of knowledge that is new to us: Instructional design models, -e-learning platforms. ■ New concepts and techniques: instructional scripting models, microlearning, interactive video, cognitive load, etc. ■ New approaches: flipped classroom, multimedia courses, adaptation
C6: The situation encourages metacognition	■ The situation enables everyone to benefit according to their personal needs: validation of the module, design skills, skills for enrolling in a doctorate, etc. ■ The situation requires planning and anticipating difficulties ■ The situation provides an opportunity to practice and enhance what has been learned.
C7: The situation motivates active engagement	■ The situation relates to a problem that we face every day in our teaching practice: how to prepare and implement a lesson that is suitable for all pupils. ■ The module will be assessed on the design of a collaborative learning situation and the analysis of its collaborative potential. ■ The profile of the multimedia course designer is now required since COVID-19 19.
C8: The situation makes it possible to develop the ZCD zone	■ We are used to designing our daily lessons individually, but we need to work together to design an online multimedia course. ■ The situation has enabled us to develop our cognitive ability to analyze complex learning situations: cognitive skills of analysis, comparison, evaluation, and integration of theoretical knowledge.

Mohamed Erradi is a professor of Higher Education at ENS Tetouan, Abdelmalek Essaadi University, Morocco. Director of the Computer Science and University Teaching Engineering research team and actif member of TIMS laboratory. Trainer in engineering and pedagogical design of e-learning systems. Specialist in adult education. Professor Erradi has published many papers in international conferences and journals. He has organized and chaired six international scientific events and has been a member of the program committee of multiple international conferences. His areas of interest include Artificial Intelligence, Pedagogical approach, Assessment methods, Andragogy, Collaboration, Personalization and E-learning. He gives training to undergraduate, postgraduate students and guides research scholars in these areas: E-learning, Andragogy, Collaboration, Personalization, Pedagogical Objects, Adaptive learning, educational technologies. He can be contacted at email: m.erradi@uae.ac.ma.

Mohamed Khaldi is a professor of Higher Education at ENS Tetouan, Abdelmalek Essaadi University, Morocco. Active member of the Computer Science and University Teaching Engineering research team & TIMS laboratory. Trainer in engineering and pedagogical design of e-learning systems. Specialist in online training and e-learning. Professor Khaldi has published many papers in international conferences and journals. He is the (co)author or (co)editor of 31 academic books and (co)author of over 200 articles and book chapters at international journals and conferences. Authored an international textbook of "Springer", "Bentham Science Publishers" and IGI Global Publicaton along with Patents and Copyright to his credit. His areas of interest include Artificial Intelligence, Pedagogical approach, Assessment methods, Adaptive Hypermedia Systems, Bayesian Networks, and E-learning. He gives training to undergraduate, postgraduate students and guides research scholars in these areas. He can be contacted at email: medkhaldi@yahoo.fr.