T I E Journal
Volume 3 Issue 1, 2025
http://ijtie.com/v301/n11
ISSN: 2820-7521

The International Journal of Technology, Innovation, & Education

Pedagogical Interactions and University E-learning Systems: Case of Moodle and Google Classroom platforms

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Received: December 27, 2024; **Accepted**: January 14, 2025; **Published**: February 28, 2025

Abstract

The harmful and unprecedented effects of the COVID-19 pandemic have disrupted economies and societies, without excluding the education sector. Against this difficult backdrop, Morocco declared a health emergency and imposed a lockdown. So, the transition from traditional face-to-face training to distance learning was imposed to ensure pedagogical continuity. This provided an invaluable opportunity to take a reflective and forward-looking look at how best to optimize the virtues of digitization on e-learning platforms as an appropriate solution in these anxious times. As a result, pedagogical interactions in an e-learning process have become a matter of concern and vital interest. Therefore, this research aims to assess the potential of e-learning platforms, in particular Moodle and Classroom, to encourage interaction between teaching staff, students, content, and interface. Therefore, we used a quantitative research approach with deductive reasoning and a positivist perspective exploiting an evaluation grid intended for students at the master's level in 'Educational Technology and Pedagogical Innovation' at the Faculty of Educational Sciences of Mohammed V University in Rabat. The results of analyses revealed that the majority of students were satisfied with the quality of teaching interactions, given the potential offered by the two e-learning platforms Moodle and Classroom, and that there was a shared awareness of the importance of digital technology in improving teaching practices in higher education. All in all, significant gains have been made regarding the state of infusion of information and communication technologies in e-learning.

Keywords: interaction, platforms, e-learning, Moodle, classroom.

Boumahdi, A., Lamouara, Z., & Azaoui, S. (2025). Pedagogical interactions and university e-learning systems: Case of Moodle and Google Classroom platforms. *The International Journal of Technology, Innovation, and Education, 3*(1), 7-32. https://ijtie.com/v301/n11

1. Introduction

Digital technology has rapidly revolutionized our cognitive repertoire by providing educational engineering with a range of tools for analysis, scripting, digital resource production, and assessment. As a result, these combined virtues are likely to result in a better experience on e-learning platforms. In addition, and given the disastrous effects of COVID-19, the quality of communication in e-learning has proved to be extremely productive and, according to Jang and Kim (2012), a major factor in the achievement of objectives, the sharing of values through social relations and the promotion of constructive interactions. With this in mind, we thought it wise to explore the e-learning environment, its diversity, its mechanisms, and its limits in terms of communication, to teach in a more interactive and synergistic framework, likely to emphasize the quality of the skills acquired. There is no doubt that e-learning does not offer miracle solutions for ensuring educational continuity on a par with the quality of face-to-face teaching. In this respect, Law et al (2019) argue that e-learning depends on the quality of the digital environment and could exacerbate certain problems such as pedagogical equity. Thus, this research aims to examine the potential of the range of technologies available on e-learning platforms, notably Moodle and Classroom, to foster pedagogical interactions. It is through fruitful reflection on the question of the quality of online interactions that we can make digital tools a privileged means of offering teaching staff greater visibility of their virtual classes and keeping learners engaged.

2. Conceptual and Theoretical Framework

2.1. University Dynamics and Contingency Movements

Faced with a changing and unpredictable development context, the Moroccan university has, since 2003, been aware of the need to reform its methods and products to cope with and conform to international contingency factors, in particular: an internationalization movement; standardization of curricula; professionalization of courses of study; the emergence of digitalization; the impetus of the knowledge economy and plurality of internal and external issues. This awareness on the part of the Moroccan university is reflected in its commitment to a new reform, following the guidelines of the National Education and Training Charter, and the promulgation of Law 01-00 (B.O, 2000) on the organization of higher education. To keep pace with these significant institutional and managerial changes, the Moroccan university has made a firm commitment to the Bologna process, as a fruitful initiative for continuous improvement

with a view to excelling in terms of leadership and governance performance, the quality of the training on offer, the quality of research and international visibility. As a result, we need to think about how to enhance and rationalize the university process by engaging in technological approaches to rethink both teaching and assessment practices in remote mode in order to: improve modes of governance that adapt to the knowledge economy; infuse digital technology without disrupting the teaching process; raise the profile of research and openness to society, as well as responding to the growing need for technical expertise.

2.2. The Covid-19 Pandemic and Educational Continuity

Covid-19 has had a severe impact on the global economy (Duan et al, 2020), and on social activities without excluding the education sector (Qiu et al, 2018). Against this backdrop of crisis, Morocco declared a state of health emergency on 20 March 2020, and a lockdown was introduced. Tate (2020), states that schools around the world suspended face-to-face teaching, and social distancing took place through the cancellation of gatherings and travel restrictions. These strict measures made it possible to partly contain the spread of emerging variants. As a result, Gardner (2020) points out that there were many scenarios for guaranteeing continuity of education, but they all involved the integration of educational technologies. E-learning was seen as a way out of the impasse and a way to alleviate the adverse effects of the pandemic. However, schools have advantages that are not covered by the e-learning process. Lieber (2020) explains that school goes beyond the transmission of knowledge to take on other functions that are more in demand by families and that cannot be achieved by studying at home, given that on the one hand, it enables the mastery of economically useful skills, and on the other hand, the acquisition of a sense of socialization, given that school is a place where people meet and exchange ideas to learn to live together. On this basis, interaction appears to be a fundamental factor in the university learning environment.

2.3. E-learning Platform and Pedagogical Interactions

Unquestionably, the more collaborative and interactive the work, the better the learners' level of engagement and rate of acquisition. In this sense, engaged learners "exhibit behaviors, thought processes, or emotions that indicate that they are connecting with the course material, with the teacher, and with each other" (Rice & Kipp, 2020). As a result, identifying the potential for interaction in an e-learning process for the Moodle and Classroom platforms offers an unprecedented opportunity to take a reflective and forward-looking look toward more fruitful

and interactive digitization. To this end, the issue of pedagogical interaction, whether learner-learner, learner-teacher, learner-resources, or learner-interface, is of the utmost importance in an e-learning process. In the wake of the COVID-19 pandemic, the switch from face-to-face classrooms to virtual classrooms was imposed to guarantee pedagogical continuity. This transition is made possible by e-learning platforms, particularly those most familiar in the Moroccan university context, notably Moodle and Classroom. On the assumption that online pedagogical interactions provide benchmarks and traces for assessing learning, a legitimate question arises: to what extent does the use of e-learning platforms promote the quality of pedagogical interactions?

2.4. Models for Integrating Digital Technologies

The integration of information and communication technologies into training systems promises to be a promising development for educational players. As part of this evolutionary dynamic, several models have attempted to explain the logical algorithms for generating a digital transformation capable of promoting the quality of managerial and pedagogical practices. The integration of digital technologies is therefore increasingly imperative if the education and training system is to remain competitive and innovative. It is a shift towards a new technological paradigm that is taking place rapidly, particularly after the anxiety-inducing period of COVID-19, shaking up archaic structures and positively influencing how the university brings value to its network of beneficiaries.

Referring to a model such as TPaCK (2013) (Technology, Pedagogy, and Content Knowledge) makes it possible to understand the meaning that justifies the integration of digital technologies into assessment practices and to ensure coherence between the technological devices chosen, the pedagogy and the content to be taught. This model aims to define the level of skills needed to use ICT in teaching practices, by assessing the teacher's ability to articulate effectively the use of digital tools, his/her teaching posture, and learning objectives. The TPACK model aims to articulate: Technology, Disciplinary Content, Pedagogy and Context to generate an optimal effect on the quality of teachers' pedagogical performance.

Wallet's PADI model (2007) is a fundamental conceptual framework for evaluating and structuring technology-enhanced training systems. This model, which takes its name from the four components it encompasses - Pedagogy, Actors, System, and Institutional - offers a systematic approach to understanding the complex issues involved in integrating technologies

into a training system. In the same vein, the SAMR model developed by Puentedura (2006), an expert in issues relating to technological transitions in education and training, represents a benchmark for assessing and improving the integration of technologies for pedagogical purposes. With its gradual continuum of four levels of pedagogical effectiveness, ranging from simple substitution to transformative redefinition, the SAMR model is designed to help teachers take hold of the virtues of technology by infusing it gently and sensibly into their teaching practices. As ALAIN LEVY (2017) explains, this model also enables teachers to discuss the use of digital tools concerning the objectives set, so that they are meaningful for learning.

3. Methodological Framework

3.1. Scope and Nature of the Study

It seemed a good idea to explore the e-learning environment in all its diversity, its mechanisms, and its communicational limits, to teach and assess in a more synergistic and interactive framework, and to emphasize the quality of the skills being developed. Information and communication technologies are certainly a lever for innovation in higher education, but under what conditions? A university education system is supposed to be geared towards the gradual and reasoned use of ICTs to support teaching and empower students, on the one hand, to innovate teaching practices, and, on the other, to optimize the processual performance of the university organization.

The study is based on a quantitative research approach with deductive reasoning that is part of a positivist positioning and is applied by employing an evaluation grid whose main items relate to the characteristics of e-learning platforms, teaching practices, and teaching interactions. This is an exploratory study, part of an evaluative approach to the state of distance learning in the Moroccan context.

3.2. Theoretical Model of the Study

The conceptual model shows the dynamic links between the various key elements of this study. According to this model (Figure 1), we can identify possible causal links between the use of the Moodle or Google classroom platforms on the one hand, and learners' interactions with peers, teachers, resources, and the ergonomic interface on the other. Given that interaction is part of the continuous improvement process, teacher leadership is at the source of this virtuous dynamic, by choosing the platform best suited to pedagogical needs and the one that offers the

most features, thus stimulating a varied range of interactions that help to optimize the quality of university e-learning.

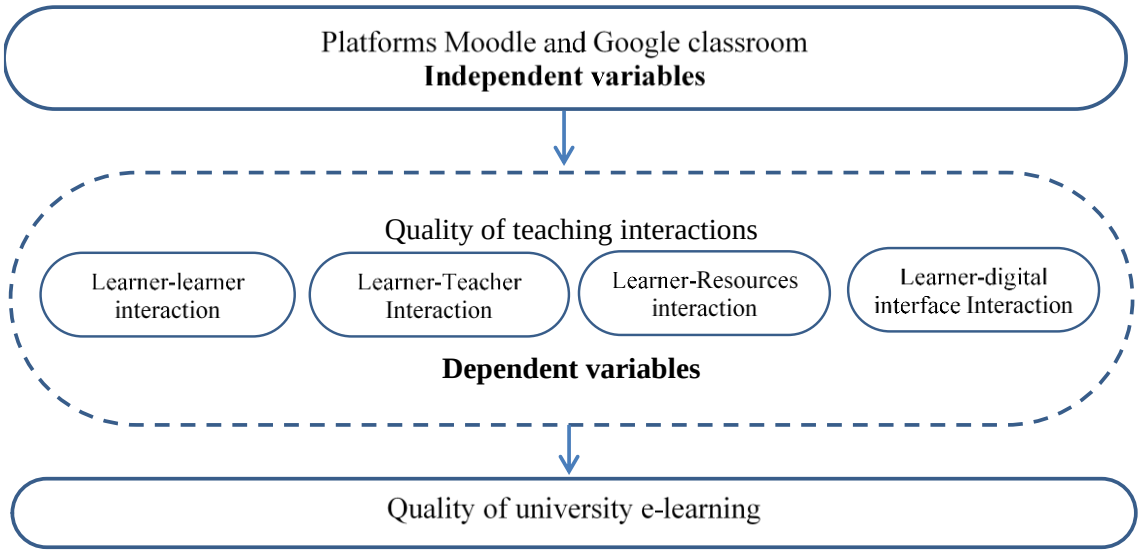

Figure 1. *Conceptual research model*

3.3. Assessment System

The research tool was created using Google Forms, to identify evidence of the contribution of e-learning to the development of teaching interactions. The evaluation grid examines four dimensions:

- Identification of users: from variable V_1 to V_4;
- Characterization of e-learning platforms: from variable V_5 to V_9;
- Teaching practices and digital resources: from variable V_{10} to V_{15}.
- Teaching interactions: from variable V_{16} to V_{28}, broken down as follows:
  - Teacher-learner interactions: from variable V_{16} to V_{18};
  - Learner-Learner interactions: from variable V_{19} to V_{21};
  - Learner-Resources interactions: from variable V_{22} to V_{24};
  - Learner-digital interface interactions: from variable V_{25} to V_{28}.

In all, 28 items deemed to be influential in an e-learning mode were evaluated. Without delving into the benefits and hazards of digital policy at Moroccan universities, we have focused instead on the direct beneficiaries of LMSs as users during the anxiety-inducing period of Covid-19. It is because their perceptions interest us that the learner takes part in all the matrices that are integrated into the pedagogical interactions dimension. The measurement scales for the two

platforms were very varied so as to produce more nuance in addition to the single and multiple response questions.

3.4. Study Sample

The research tool was designed for a sample of 150 students in the "Educational Technology and Innovation" Masters course at the Faculty of Education (Figure 2). Through non-probabilistic and purposive sampling, we had a return rate of 105 responses, 100 of which were executable, with an effective return rate of 66.6%.

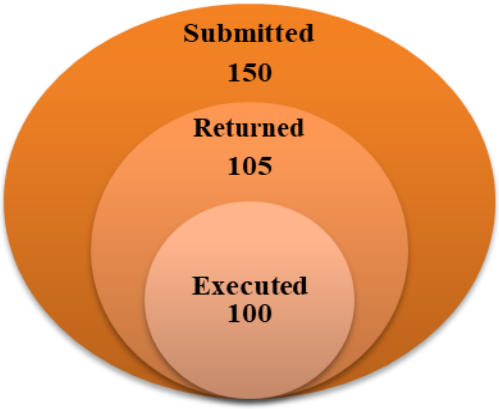

Figure 2. *Evolution of the study sample*

Statistical analyses were therefore carried out in order to gain a better understanding of the research question. Respondents gave their opinions on the functionalities of the e-learning platforms, and it was essential to assess their level of satisfaction with the teaching interactions.

4. Practical Framework

4.1. Frequency Analysis

4.1.1. *User Profiles*

Most users of e-learning platforms are students on flexible working hours (Figure 3). This is perfectly normal, given that employees find it difficult to manage their time because of their work commitments. In addition, e-learning offers learners greater flexibility and a variety of time arrangements to suit all needs, particularly for those living in geographically remote areas.

4.1.2. *Characterization of E-learning Platforms*

Students who have already had their first experience of virtual classes are very satisfied with the usefulness and ease of use of the two e-learning platforms, Moodle and Google Classroom (Figure 4).

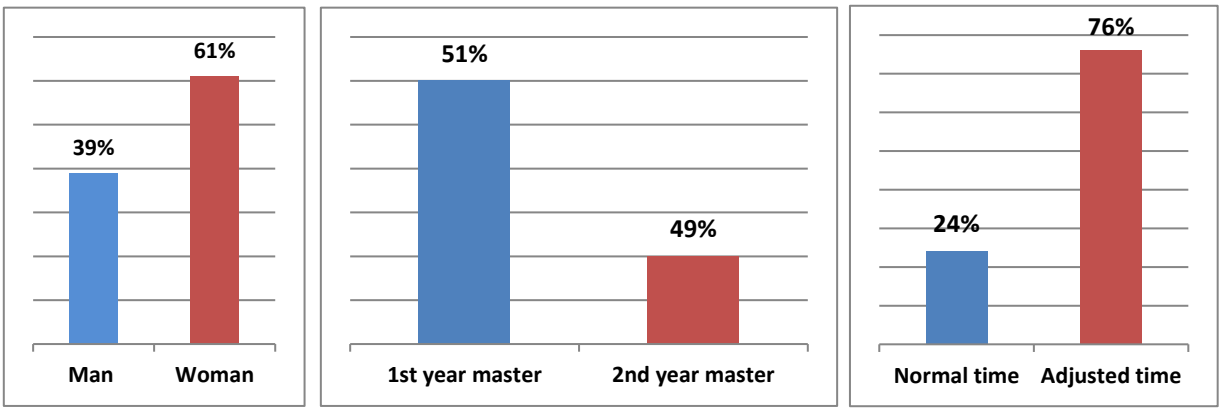

Figure 3. *LMS platform user profile*

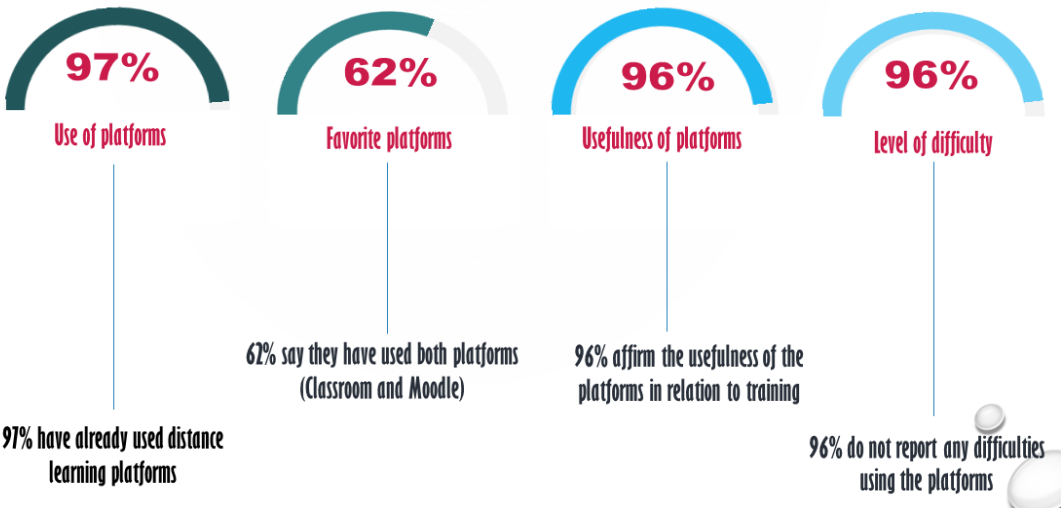

Figure 4. *Characteristics of e-learning platforms*

4.1.3. *Teaching Practice and Digital Resources*

Interactivity and media:

The majority of respondents say that using e-learning platforms makes their course materials interactive. This is due to the potential offered by these digital spaces (commands, tools, functionalities, etc.), which favors the level of interactivity (Figure 5). The figure also shows that 90% of respondents prefer a multimedia course (hypertext, audio, video, etc.), while the remainder of their preferences are split between other forms of support such as PDF files, paper documents, and note-taking.

Teaching methods:

Figure 6 shows that the majority of respondents (96%) said that the use of e-learning platforms had successfully changed the way teachers taught. Also, 57% of respondents said that some

teachers adopted an incentive style, followed by the associative teaching style and, to an equal and limited extent, the classical and permissive style.

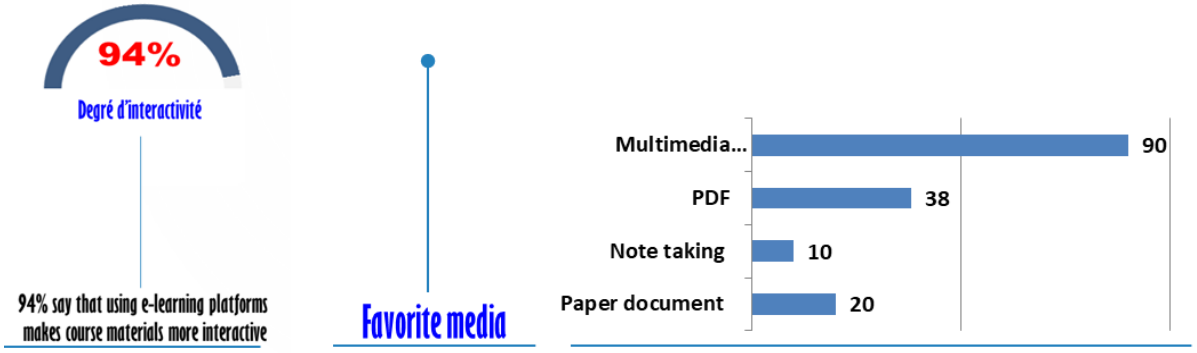

Figure 5. *Interactivities and support in e-learning*

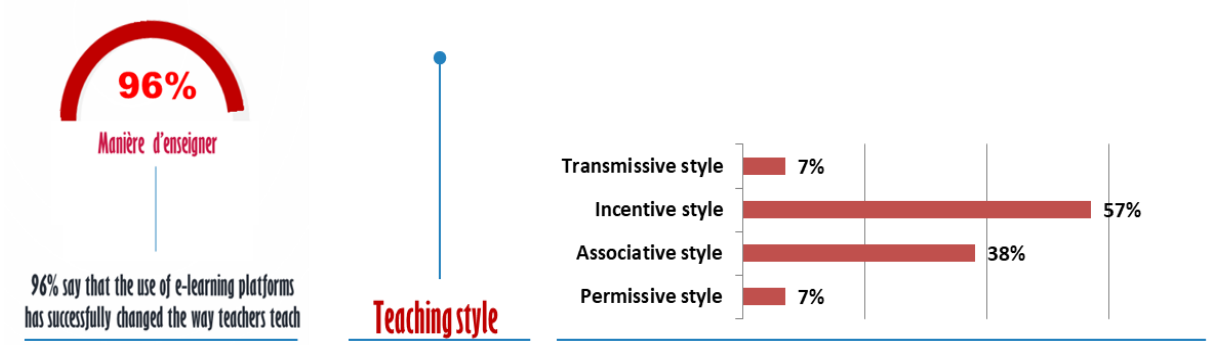

Figure 6. *Teaching methods for e-learning*

Learning methods:

As figure 7 shows, 96% of respondents say that the use of e-learning platforms has definitely changed the way they learn. Given the diversity of potential offered on the platforms, students can expose their creative impulses through a multitude of forms of response and representation such as tables, diagrams, mind maps; discussions with others, mental imagery, and stories.

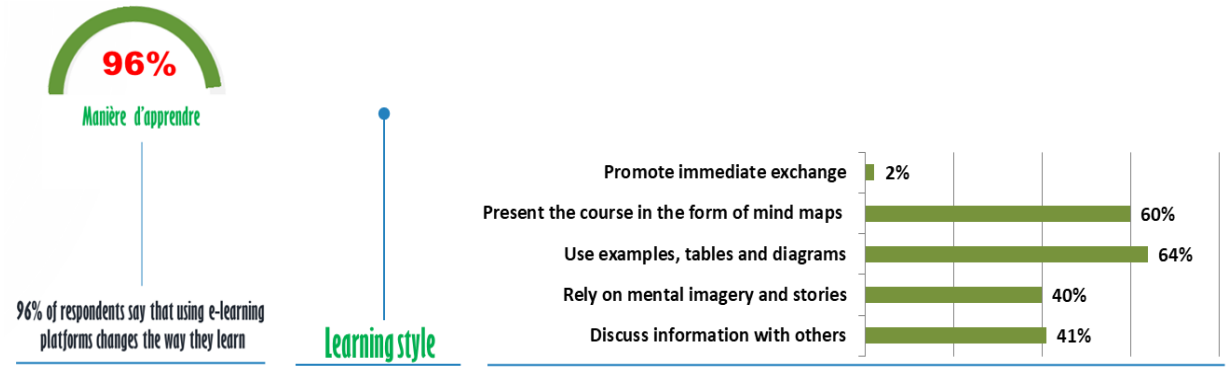

Figure 7. *The e-learning learning process*

4.1.4. *Teaching Interactions*

The study's conceptual model sets out four types of pedagogical interaction, about the types of LMS used, in particular Moodle and Google Classroom. Each interaction is fed by indicators that reflect its quality in digital environments. The aim is to measure students' cognitive and social presence as a factor influencing the quality of pedagogical interactions in e-learning. To make it easier to read the data analysis collected, we have grouped the results for the items according to the response modalities to give an opinion on the level of student satisfaction with the two platforms, Moodle and Classroom.

4.1.4.1. Learner-Learner Interaction

Based on the 100 respondents, the analysis shows that a total of 80.5% of respondents declared a high level of satisfaction with the promotion of collaborative work between peers using e-learning platforms (Figure 8). Also, 75.5% of respondents were satisfied with the exchange of information between peers, and 75% with the facilitation of mutual assistance between peers. On this basis, the average percentage of students who were satisfied or very satisfied with learner-learner interaction on the Moodle and Classroom platforms was 77%.

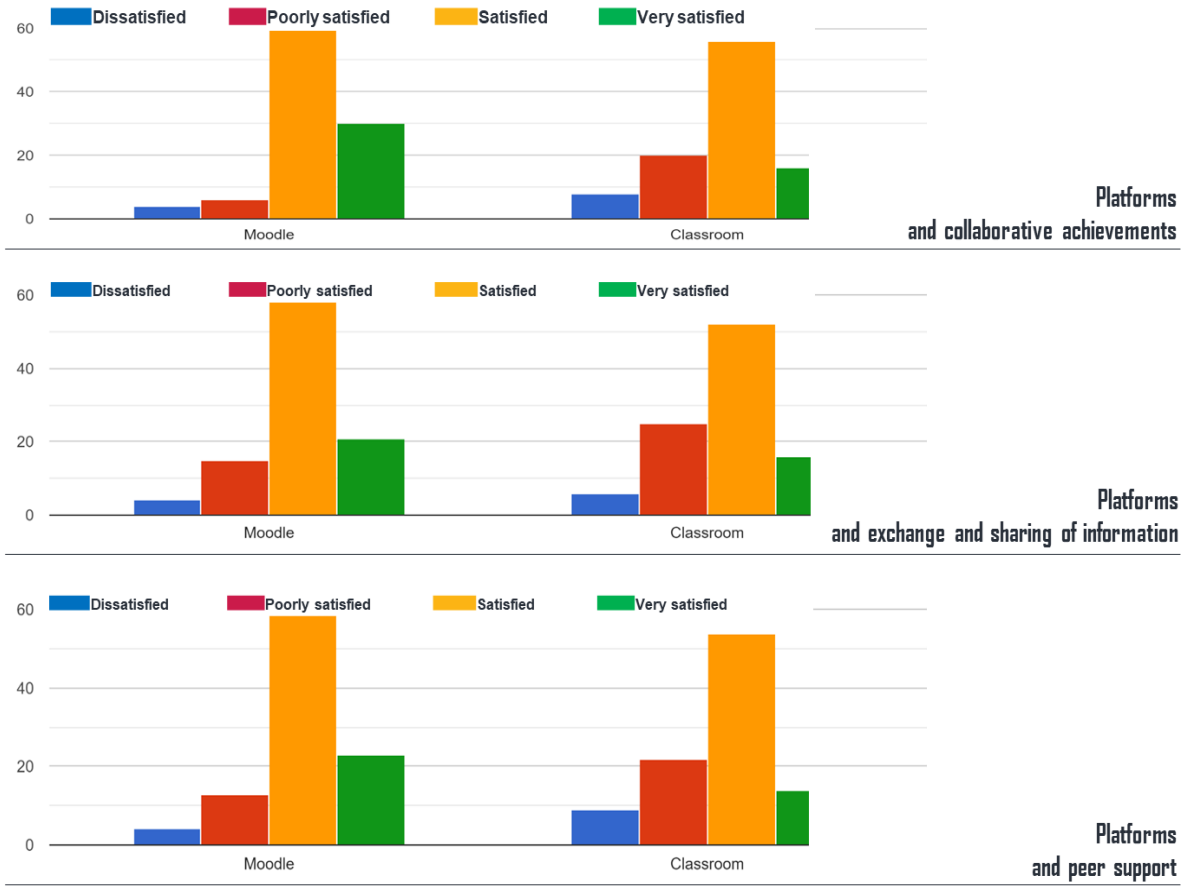

Figure 8. *Learner-learner interactions in e-learning*

4.1.4.2. Teacher-Learner Interactions

According to figure 9, 77.5% of respondents expressed satisfaction with the technological potential offered to teachers on the two platforms to create collaborative and interactive activities. Similarly, 88.5% of respondents were satisfied with the sharing and exchanges that the platforms enabled with teachers. This result attests to the existence of an environment conducive to collaboration that generates greater social presence. The figure also shows that the majority of respondents (81%) expressed satisfaction with the possibility offered by the platforms to teachers to provide feedback on learners' work. The possibility of providing such feedback reduces transactional distance and improves emotional reactions, openness to communication, and group cohesion.

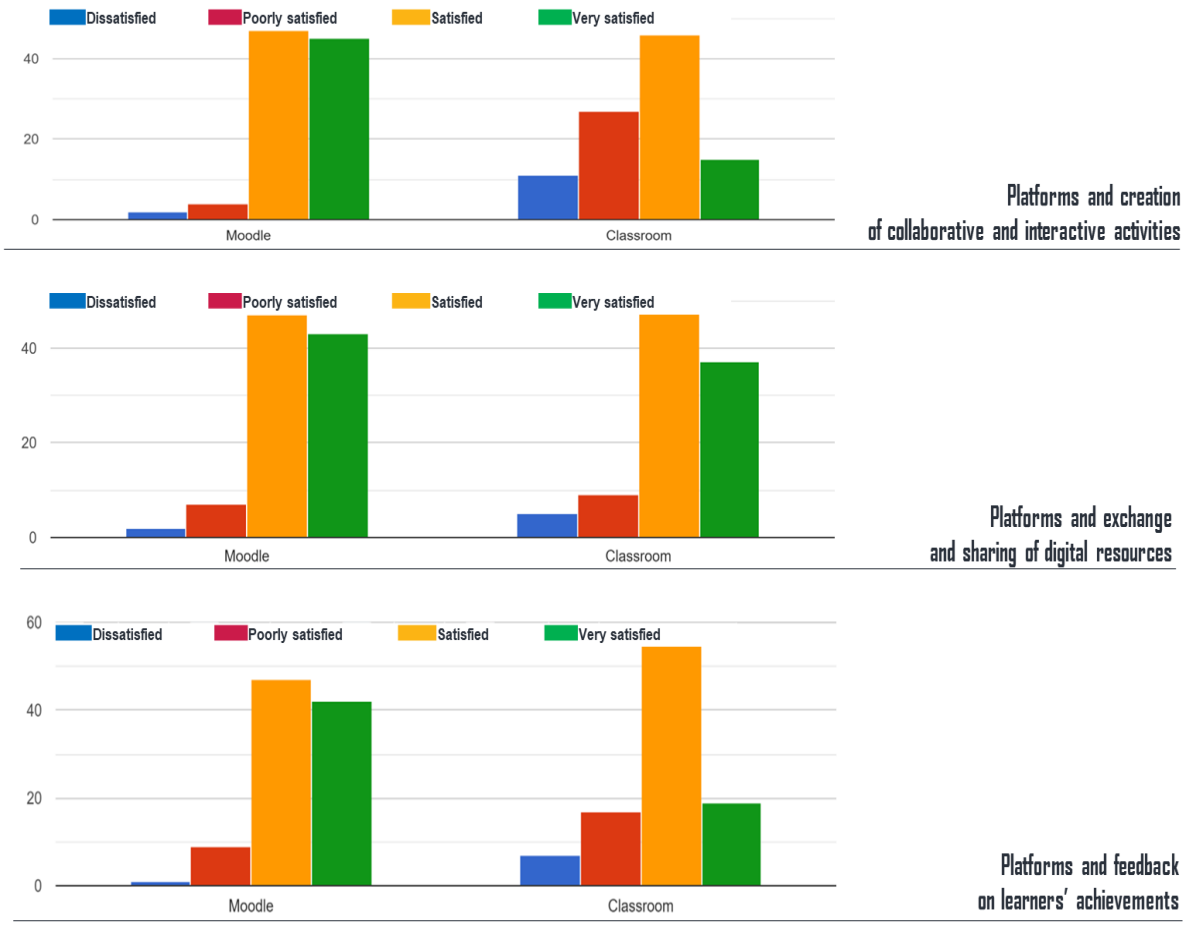

Figure 9. *Teacher-learner interactions in e-learning*

4.1.4.3. Learner Interaction with Digital Resources

According to the results obtained, the majority of respondents (78%) were satisfied with the handling/editing of materials on the two e-learning platforms (Figure 10). The fact is that manipulating material helps to stimulate students' level of understanding, as well as positively

correlating learning. Similarly, 72% of students said they were satisfied with the content offered by the e-learning platforms. The results also show that the provision of interactive content on Moodle generates significantly more interaction than Google Classroom. Furthermore, 72.5% of respondents who use the Moodle platform are more satisfied to very satisfied with the possibility of using the platform to produce multimedia content.

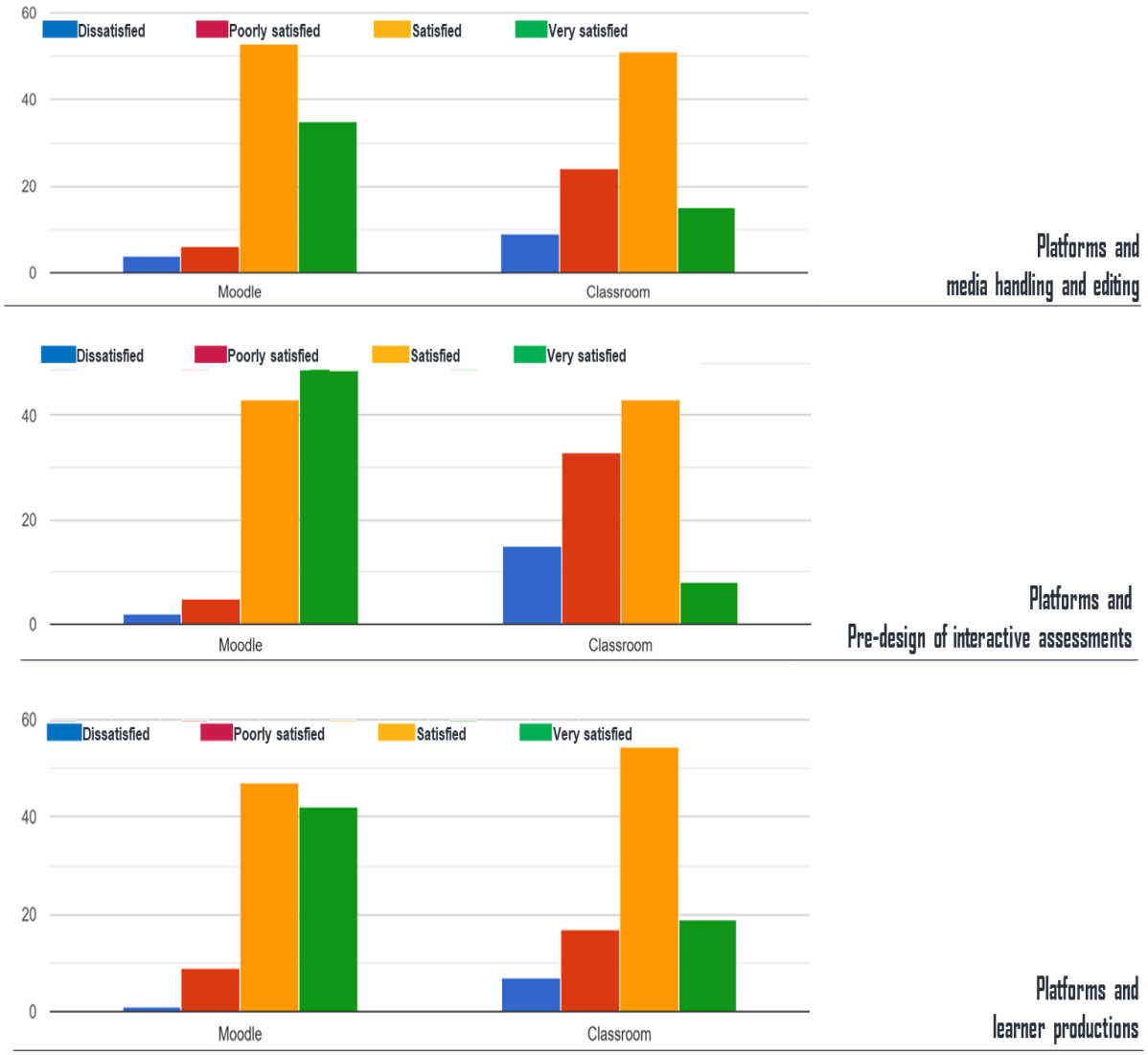

Figure 10. *Learner interactions with digital e-learning resources*

4.1.4.4. Learner Interactions - Digital Interfaces

A total of 76.5% of respondents stated that they were satisfied or very satisfied with the quality of the ergonomics of the interfaces of the two e-learning platforms (Figure 11). At the same time, 71% of students said they were satisfied with the functionalities of the interface of the two platforms, particularly Moodle, and with the means of control and initiative, such as the

ability to return to menus and sub-menus, the possibility of jumping forwards/backward, the possibility of interrupting/resuming, the variation of parameters, and so on. The results also show that 68.5% of respondents are satisfied with the possibility of communicating easily via the various audiovisual and chat channels in the two e-learning platforms. All in all, the average calculation reveals that 71% of students are satisfied to very satisfied with learner-interface interaction.

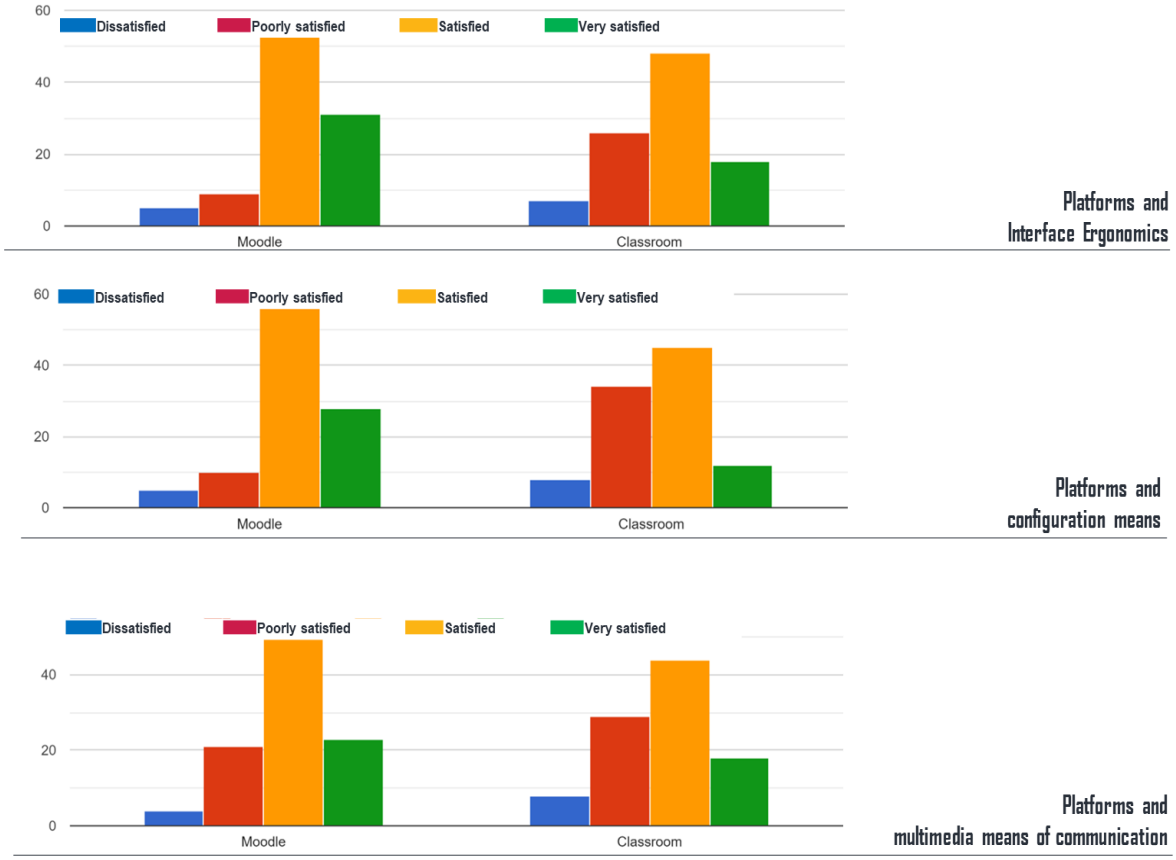

Figure 11. *Learner interactions with digital e-learning interfaces*

4.2. Correlation Analysis

Asking the following question: Is there a relationship between the platform used and learners' interactions with peers, teachers, resources and the quality of the digital interface? To study the significance of the relationship between these variables, hypotheses H0 are put forward to deny any relationship between the platform used and the types of learner interaction involved. At the same time, H1 hypotheses are put forward, according to which there is a relationship between the platform used and learner interaction. In order to infer a relationship between the variables concerned, we calculated the correlation coefficient.

4.2.1. *Correlation between Platform Used and Peer Interaction*

The wording of target variables:

- **Variable Q17**: The platform enables you to exchange information via conversational tools.
- **Variable Q16**: The platform enables you to work collaboratively by carrying out practical tasks.
- **Variable Q18**: The platform makes it easier for you to help each other and interact with your peers.

Benchmark data:

- The significance is less than 0.05: p=0.000 is below the significant threshold (Table 1). The null hypothesis (H0) is therefore rejected, and there is a significant relationship between the variables.
- Spearman's correlation ranged from 61.5% to 70.3% for the two platforms Moodle and Google Classroom: we conclude that there is a correlation between the variables whose strength ranges from high to very high. Moreover, the interaction between the pairs evolves at approximately the same level on the two platforms.

Table 1. *Summary cross-tabulation of learner-learner interaction correlations*

Platforms	Variables	Spearman correlation	Sig (bilateral)
[Moodle]	Q_{16}-Q_{17}	,669**	,000
	Q_{16}-Q_{18}	,642**	,000
	Q_{17}-Q_{18}	,615**	,000
[Classroom]	Q_{16}-Q_{17}	,654**	,000
	Q_{16}-Q_{18}	,615**	,000
	Q_{17}-Q_{18}	,703**	,000

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

As in face-to-face teaching, interaction methods and tools are not an end in themselves but must be at the service of pedagogy and pedagogical objectives (Chovino and Dallaire, 2019).

In e-learning mode, peer interaction and collaboration help to create a calm and conducive environment for the role-playing necessary to ensure that the learning scenarios run smoothly. The most extraordinary aspect of this interaction process is the feeling of belonging together,

which enhances the achievement and self-esteem of all participants. These significant gains in performance accelerate the skills being built and consequently transform the general mental state. Papi et al. (2017) explain that the devices involved in interaction reduce the distance between students and enrich the experience by diversifying learning situations and providing more social presence. However, care must be taken to ensure that the right tools are used to encourage interaction and to favor the logic of support over the logic of control.

One of the tools for generating more interactivity in virtual classrooms is peer assessment, which involves learners evaluating each other's work or performance. Peer assessment can help learners develop critical thinking, self-regulation, and communication skills, as well as provide timely and diverse feedback. Peer feedback also involves learners providing each other with constructive comments and suggestions on submitted work. This helps learners to improve their work, identify strengths and weaknesses, and learn from different perspectives. Another useful collaborative tool in this respect is peer-to-peer discussion. This involves learners exchanging ideas, opinions, and questions with each other.

Peer-to-peer discussion is very much like social learning, involving a variety of conversational tools such as chat and discussion forums that make it easy to exchange information and share good practices. Peer-to-peer interaction can help learners deepen their understanding, clarify doubts, and explore new topics. Some of the tools that can support peer discussion are Piazza, Flipgrid, and Padlet. Peer-to-peer work can also go further by allowing learners to engage in collective metacognitive reflection based on non-threatening exchanges, due to the symmetry of status.

By lowering socio-affective risks, confidence and motivation are likely to increase (Manoïlov, 2020) Group work is still original in that it creates a constructive, competitive, and stimulating climate. It involves several tools such as Google Workspace, Miro, and Slack and implies that learners work together on a common task or project. Collaboration via peer-to-peer group work can help learners develop teamwork, problem-solving, and creativity, as well as produce more diverse and innovative results. "Placing learners in a situation of interaction between peers (in cooperative or collaborative mode) implies granting them autonomy of action since the teacher is no longer there to regulate the exchanges". (MENJ 2019)

4.2.2. *Correlation between the Platform Used and Learner-Teacher Interaction*

The wording of target variables:

- **Variable Q19**: The platform enables your teacher to create collaborative and interactive activities.
- **Variable Q20**: The platform enables your teacher to share and exchange documents.
- **Variable Q21**: The platform enables your teacher to provide feedback on learners' content, for example (validation, lack of understanding, request for repetition, etc.).

Benchmark data:

- The significance is less than 0.05: p=0.000 is below the significant threshold. The null hypothesis (H0) is therefore rejected, and there is a significant relationship between the variables.
- For the Moodle platform, the Spearman correlation varies negatively at around 22% (Table 2). We conclude that there is a weak correlation between the variables. On the other hand, the correlation varies positively from 43.6% to 61.3% for the Google Classroom platform, which shows that there is a correlation between variables whose strength varies from medium to high. Furthermore, the interaction between learners and teachers was more significant on the Google Classroom platform than on Moodle. This difference can be explained by the fact that the Google Classroom platform is the one most used by teachers because it is free and easy to use, whereas the Moodle platform is used only to a limited extent, via private, non-university licenses.

Table 2. *Summary cross-tabulation of learner-teacher interaction correlations*

Platforms	Variables	Spearman correlation	Sig (bilateral)
[Moodle]	Q_{19}-Q_{20}	-,220*	,000
	Q_{20}-Q_{21}	-,220*	,000
[Classroom]	Q_{19}-Q_{20}	,458**	,000
	Q_{19}-Q_{21}	,613**	,000
	Q_{20}-Q_{21}	,436**	,000

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

Today, e-learning, as a solution favored by universities, has become a much sought-after field of research. In this context, "the teacher-learner relationship is a reflective issue in its own right insofar as it has a decisive impact on student performance, to the extent that the establishment of a positive pedagogical relationship is now seen as a decisive factor in academic success". (BIEMAR, 2009) and (KOZANITIS, 2015) The emergence of new ways of teaching in e-learning has led to a gradual

break with traditional teaching-learning practices, but despite this shift towards virtual classrooms, the success of the platforms is still far from ensuring interactions at a level comparable with face-to-face teaching, particularly in terms of learner visibility and visual presence.

The analysis of online interactions is currently considered to be an autonomous disciplinary field, which finds its legitimacy in its contribution to studies of mediated learning in the university environment. (Marcoccia, 2004) The quality of interactions with the teacher is a determining factor since it allows for highly enriching human contact. On LMS platforms, teachers can provide their teaching services and monitor the progress of collaborative and resource-sharing activities in real-time, making it possible to assess learners' acquisition levels. During this process, the teacher can intervene to provide immediate or deferred regular feedback by creating personalized remedial paths.

Cornut (2024) explains that "For a long time, assessing the impact of training was complex. But thanks to Learning Management Systems (LMS), it is now much simpler to assess the progress of your learners using a range of metrics: module completion rates; assessment success rates; commitment rates for your training courses; time spent on a given module, etc. And all this data is accessible in real-time! So, you can adjust your content easily, and even adapt it according to the learner's profile". Sharing and collaboration create a favorable climate for boosting learners' cognitive engagement and improving performance. Gamification spaces could be aligned with pedagogy to learn differently and stimulate curiosity and the transposition of knowledge into various contexts.

4.2.3. *Correlation between the Platform Used and Learner-Resource Interaction.*

The wording of target variables:

- **Variable Q22**: The platform allows you to manipulate/edit a medium.
- **Variable Q23**: The platform offers interactive content (quizzes, multiple choice questions, etc.).
- **Variable Q24**: The platform allows you to produce content.

Benchmark data:

- The significance is less than 0.05: p=0.000 is below the significant threshold. The null hypothesis (H0) is therefore rejected, and there is a significant relationship between the two variables.

– Spearman's correlation ranged from 53.0% to 79.8% for both Moodle and Google Classroom (Table 3). We conclude that there is a positive correlation between the variables, the strength of which ranges from high to very high. Furthermore, the interaction between learners and resources evolved slightly more on the Moodle platform than on the Google Classroom.

Table 3. *Summary cross-tabulation of Learner-Resource interaction correlations*

Platforms	Variables	Spearman correlation	Sig (bilateral)
[Moodle]	Q_{22}-Q_{23}	,726**	,000
	Q_{22}-Q_{24}	,730**	,000
	Q_{23}-Q_{24}	,798**	,000
[Classroom]	Q_{22}-Q_{23}	,616**	,000
	Q_{22}-Q_{24}	,530**	,000
	Q_{23}-Q_{24}	,709**	,000

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

The digital resources are very varied and include all types of digital multimedia content such as documents, audio files, video files, logos, slides, spreadsheets, websites, blogs, GIFs, infographics, PDFs, and images. The interactivity of learners with the content made available to them is based on two parameters: personal enjoyment and interest, the combination of which produces a resolute and permanent commitment. As a result, it is useful to choose specific digital resources with a high scientific value that are likely to accelerate interactivity and facilitate the development of skills. The creation of a synergy in the pedagogical act that the teacher proposes to the learners can improve the quality of interactions and making them evolve.

Indeed, successful interactivity is highly likely when it is conditioned by the introduction of suitable teaching techniques, such as breakout sessions, brainstorming, case studies, or simulations since they are geared more toward team cohesion and communication. Laurendeau (2020) points out that to stimulate interaction with the text, teachers can create online quizzes (e.g., Quizizz, Quizlet, Google Form). To interact with a historical photo or anatomical diagram, applications such as Genially or Thinglink allow students to access additional information or questions when the mouse passes over a specific part of the image. And to prevent students from being passive in front of a video, there's nothing like integrating text, a hyperlink, or even a quiz with Edpuzzle or Vizia, for example. It's important to say that these techniques are

among the ingredients that need to be considered to embed new skills seamlessly and build a thriving classroom.

4.2.4. *Correlation between the Platform Used and Interface Quality*

Wording of target variables (Table 4):

- **Variable Q26**: The platform offers you means of control and initiative, for example (return to menus and sub-menus, the ability to skip forward/back, the ability to interrupt/resume, change parameters, etc.).
- **Variable Q27**: The platform allows you to create personalized discussion rooms (room per group)
- **Variable Q28**: The platform allows you to communicate easily via different channels (audio, visual, text).

Table 4. *Cross-tabulation of learner-interface interaction correlations*

Platforms	Variables	Spearman correlation	Sig (bilateral)
[Moodle]	Q_{25}-Q_{26}	0.622**	,000
	Q_{25}-Q_{27}	0.416**	,000
	Q_{25}-Q_{28}	0.451**	,000
	Q_{26}-Q_{27}	0.687**	,000
	Q_{26}-Q_{28}	0.621**	,000
	Q_{27}-Q_{28}	0.618**	,000
[Classroom]	Q_{25}-Q_{26}	0.613**	,000
	Q_{25}-Q_{27}	0.439**	,000
	Q_{25}-Q_{28}	0.537**	,000
	Q_{26}-Q_{27}	0.619**	,000
	Q_{26}-Q_{28}	0.560**	,000
	Q_{27}-Q_{28}	0.598**	,000

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

Benchmark data:

- Significance is less than 0.05: p=0.00 is below the significant threshold. The null hypothesis (H0) is therefore rejected, and there is a significant relationship between the variables.
- The Spearman correlation ranges from 41.6% to 68.7% for the Moodle platform and 43.9% to 61.9% for the Google Classroom platform. We conclude that there is a medium to high correlation between the variables. Furthermore, the interaction between learners and the interfaces of the two platforms evolves at approximately the same level.

Interaction with the two interfaces of the Moodle and Google classroom platforms is the most dominant, and the number of bi-variate correlations bears this out. This seems obvious insofar as e-learning and virtual classes are a new trend, and users have a pleasant experience focused on exploring the space and tools. Emerging technologies have revolutionized the world of university teaching and are accelerating at a breathtaking pace, impacting on teaching practices and the way learners learn. These changes herald the emergence of a new pedagogical model and new opportunities for those who can act swiftly to seize them.

Enhancing the attractiveness of e-learning and improving the pedagogical quality of training courses involves making the interface more ergonomic through pleasant navigation, an easy path to the right information, the ability to interface with other multimedia tools, and an aesthetically appealing design. In general, platform interfaces are expected to meet users' needs through personalized spatiotemporal layouts and advanced functionalities. In short, ergonomics aims to adapt LMS platform interfaces to users' explicit, implicit, and latent requirements.

5. Discussion of the Results

The results of our analyses revealed that the majority of students were satisfied with the quality of teaching interactions on the two e-learning platforms: Moodle and Classroom. The survey also showed that the use of e-learning platforms has changed the way people learn and teach, and that there is a shared awareness of the importance of digital technology in improving teaching practices in higher education. Calculating the correlation therefore revealed a significant and positive relationship between the platforms used and the teaching interactions, leading to a majority satisfaction with the teaching interactions. High-quality interactions imply a change in learning and teaching methods to arouse the interest of the target audience and

increase attention spans. In addition, there is a shared awareness of the importance of LMSs in improving teaching practices. This can be explained by:

- LMSs as a field for experimenting with teaching and learning practices;
- The advanced features and attractive ergonomics of the Moodle and Google Classroom platforms;
- E-learning takes many forms and uses a vast array of techniques;
- The promotion of varied educational resources and rapid, non-strenuous assessment systems.

Initially, the priority was to ensure pedagogical continuity regardless of the technical aspects. It's fair to say that we weren't too demanding on this point. All alternatives were welcome, without exception. So, the virtues of technology do not prevent us from exposing certain pitfalls that remain in the shadows. Two issues remain of concern:

- The question of interaction, insofar as teaching and learning do not work well in a non-social and unmotivating environment;
- The question of visual and vocal presence in virtual classrooms. To this end, we need to think about developing communication devices that can revitalize learners' level of concentration and, consequently, reinvigorate the skills-building process.

The difficult times of the pandemic were a golden opportunity to put the pedagogical and technological potential of platforms to the test with a very wide audience throughout the world. So, if we are to achieve a gentle infusion of ICT while generating greater creativity, more innovation, and, in particular, more pedagogical interaction, we need to think about aligning the work of the designer with that of the pedagogue to:

- Adapt the digital mode to pedagogy and not the other way around;
- Technicize while preserving the nobility of the teaching act;
- Develop monitoring systems to reduce signs of dishonesty and disinterest;
- Develop devices that provide more vocal and visual presence.

To avoid perilous transitions from one model to another, the technology model as a new institutional culture must take into account several vital aspects necessary to reap the benefits of the emergence of digital technology for educational purposes:

- Apply standards gradually and progressively;

- Draw on internal culture without eradicating it;
- Ensure that technological concepts are contextualized;
- Move from a "quality system mode" to a "mode quality system".

6. Conclusion

There is no doubt that digital technology is helping to improve the quality of the education and training process through multi-dimensional teaching situations, the promotion of varied educational resources and rapid, non-exhausting assessment systems. However, the question of interaction remains a cause for concern, since teaching and learning do not work well in a non-social and unmotivating environment, even though interaction, as Raes et al (2020) emphasize, is an essential means of activating students cognitively during lessons. It is through a permanent and effective relay of information flows, via communication devices, that we will be able to revitalize the level of concentration of learners and consequently reinvigorate the process of building skills. In short, e-learning platform designers are well advised to take advantage of feedback from users to optimize digital interfaces and make them more attractive and interactive.

In conclusion, the work presented in this research focuses on the impact of the use of interactive teaching/learning platforms in fostering pedagogical interactions. Our research objective was to take stock of the importance of the use of these platforms in fostering pedagogical interactions. With this in mind, our research work was divided into two main parts: a theoretical part, which consisted of a literature review that made it possible to identify all the theoretical knowledge needed to understand the main themes of the study, and an empirical part, which was devoted to an investigation carried out with the help of a research tool: a questionnaire distributed online to students in the TEIP Master's program at the Faculty of Education of Mohamed V University in Rabat.

We received 100 responses, which enabled us to carry out statistical analyses. This enabled us to verify our initial hypothesis and gain a better understanding of the research question. To do this, we asked respondents to identify the platforms used, as well as the degree of difficulty in using them, their preferred course materials, teaching practices, and their level of satisfaction with teaching interactions. The responses confirm that most of the students (97%) have already used e-learning platforms, whether Moodle and/or Classroom. As a result, 91% of respondents reported no difficulties in using these platforms. The results also show that 96% of respondents

say that using e-learning platforms changes the way they learn and the way their teacher teaches, and that using e-learning platforms makes their course material interactive.

Concerning pedagogical interactions, the study showed that 76.3% of respondents were satisfied with the quality of pedagogical interactions using the two e-learning platforms. According to the Spearman correlation calculation, we found that there was a significant and positive relationship between the platforms used and the teaching interactions. This confirms the initial hypothesis.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

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