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Social Interaction through WhatsApp and the Roles Played by Students in Learning Environments

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Abstract

There is broad agreement on the positive impact of social interaction on students' learning. However, it has not been analysed whether the role they play in the learning environment is related in some way to the interaction among them. In this study, the relationship between the role played by an actor in a learning environment and the frequency and quality of the social interactions is analysed. An activity was designed to foster and facilitate social interaction among students using the WhatsApp platform. This initiative thoughtfully outlined various roles that students could undertake, alongside establishing specific categories meticulously designed to facilitate the comprehensive analysis and quantification of the quality of these interactions. A comprehensive analysis was conducted on a substantial dataset consisting of a total of 1,136 messages. With these data, a correlation analysis was conducted with the Kruskal-Wallis's test and then a post-hoc test with the Mann-Whitney U test was also performed. The results show that there is no relationship between the role played by actors and the interaction they conduct in a learning environment. Another reading of the same point is that any effort to promote social interaction in learning environments will benefit all the actors involved, regardless of the role they play.

Keywords: social interaction, roles, learning, university education, WhatsApp.

1. Introduction

This research study analyses the relationship between the role played by an actor in a learning environment and the frequency and quality of the interaction achieved.

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Social interaction has been established as a new epistemological orientation, in which the object of study is the system formed by the relationship among subjects and the relationship between subjects and the environment (Marc, Picard, 1992). In learning environments, encouraging peer interaction and support are key factors (Lee et al., 2011). When the interaction is established, it positively influences the active learning of students (Molinillo et al., 2018), the course is more pleasant and effective (Lee et al., 2011), better performance is promoted (Kurucay, Inan, 2017) and it increases students' learning commitment (Wang et al., 2022). Along the same lines, it is important to mention that some authors have found that face-to-face interaction and online interaction have different impacts on the learning process. According to Chettaoui et al. (2022), the former favours the desired learning and increases satisfaction, while the latter fosters autonomy and allows the development of greater depth in reasoning. Mena-Guacas, Velandia (2020) complement this by saying that technologically mediated interaction requires sufficient time to consolidate.

The types of interaction can be classified into the ones between student and teacher, student and content, between students (Moore, 1989) and with the interface (Hillman et al., 1994). Additionally, it can also be between teachers, the teacher and the content and even between the data in the content (Anderson, Garrison, 1998). It is worth mentioning that each of these types of interaction generates different results, for example, Bailey, Almusharraf (2022) found that the interaction between students generates greater anxiety towards foreign languages than the student-teacher interaction (Baile, Almusharraf, 2022). In this research, was considered the interaction that takes place between students.

Interaction is understood as the action to establish a relationship with the other. There is interaction when an impact is generated on the actors that establish that relationship (Abril, Alvarado, 2020). Furthermore, Goffman (1959 in Gómez, Shafirova, 2016) point out that the role is a social construction that arises in the interaction and that defines the behaviour of the actors, who in this case are students.

Role play aims to ensure empirical learning in various circumstances by improving the efficiency and availability of educational resources (Sun et al., 2022). The role-play strategy improves students' communication skills (Latif et al., 2018) and is effective in improving their motivation, learning (Saptono et al., 2020) and collaboration (Wang et al., 2020). It also has positive effects on the acquisition of knowledge and improvement of skills (Chen et al., 2021), and induces not only technical learning but also socio-institutional learning and commitment to collective action (Salvini et al., 2016) and is useful for successfully engaging all students when teaching difficult topics (Gillis, Taylor, 2018). However, role pressure has a significant negative impact on learning satisfaction (Guibin, Jinyang, 2021).

Throughout time, students have assumed multiple roles (Yu, 2022), which depends on the area of knowledge, the purpose of the course and the teacher's intention. Bunt (2021 in Lance, 2021), for example, proposed the following three different roles for higher education computer science and information technology establishments: business analyst (reading), web developer (writing) and customer service representative (engaging). Roles cannot be arbitrarily defined in a learning strategy because students engage socially and cognitively with them (Yu, 2022) and agents with similar roles tend to share their learning and specialise in certain subtasks (Wang et al., 2020).

Research on video games has explored the relationship between interaction and roles. Cole, Griffiths (2007) found that massive multiplayer online role-playing games (MMORPGs) are highly socially interactive environments that provide an opportunity to build strong friendships and emotional relationships. The study proved that social interactions in online games form a considerable element in the enjoyment of playing (Cole, Griffiths, 2007). Role playing generates greater student engagement and the interaction in class improves substantially (Pheny, Shun, 2009). In an environment outside of education they can, for example, help couple relationships in the development of social interactions (Hawkins, Hertlein, 2013).

Social networks are rethinking the basic forms of communication, interaction and production of knowledge (Fainholc, 2015), and are implanted in the personal activity of university students (Poza-Luján et al., 2015). For this reason, they encourage an unusual social, professional and academic interest (Cabero et al., 2016). In the present research, the interaction analysed was conducted through WhatsApp groups.

To sum up, it is worth noting that the research project from which this article is derived is titled Network Learning as a theoretical and methodological alternative for the promotion of

interaction in virtual university learning scenarios. This project was approved by the Bioethics Subcommittee of the Bogotá campus of the Universidad Cooperativa de Colombia, through concept 002 of 2017.

1.1. Role’s definition and interaction

In this research, the four roles defined by Mena-Guacas (2018) were adopted, which are set forth in [Table 1](#).

Table 1. Description of the actors’ roles in a learning environment

Roles	Definition
Distributor	Analyses and distributes activities among their peers
Transcriber	Records everything that happens while the proposed task is being developed
Compiler	Prepares the assigned work reports
Reviewer	Audits the process

Source: [Mena-Guacas, 2018](#)

Interaction, meanwhile, is analysed based on frequency and quality. Frequency refers to the number of times an actor participates in a learning environment and quality refers to the value that the interaction brings to the collaboration between actors. Quality was assessed based on the table proposed by Mena-Guacas (2018).

Table 2. Categories to assess the quality of the actors’ interaction in a learning environment

Category	Description
Parallel	When work is done together with another person, but without communicating or Messages parallel to the topic of work, such as greetings, farewells, thanks, etc.
Two-way response	Response of one individual to another, in which agreement or disagreement is shown, without arguments
Opinion	Communicative flow between two people, in which the messages are not consistent
Reactive	Coherent response from one individual to another showing agreement or disagreement, with arguments or Simple question
Complete	Coherent conversation of more than two messages in which agreement or disagreement is shown, with arguments or More elaborate question in the context of a conversation of more than two messages

Source: [Mena-Guacas, 2018](#)

2. Methodology

The study variables are: 1) the role students play in an activity and 2) the frequency and quality of interaction. The data was taken from a postgraduate course in the Department of Education at Universidad Cooperativa de Colombia.

2.1. Design of the activity

The design of the activity has the purpose of favouring the interaction between the actors of the learning environment. For this reason, it was taken into account that when the interaction works properly, learning networks are formed ([Siemens, 2004](#)) and for this to happen, a team goal must be defined, because these generate a dependency between personal success and the success of the team ([Johnson, Johnson, 1989](#)). Additionally, cognitive development occurs when there is first a social approach and then an individual approach to the subject ([Vigotsky, 1978](#)). Also, there is more success in learning if first there is a connection with the subject and then cognition ([Castells, 2009](#)).

The stages included in the activity designed are ([Mena, 2018](#)):

- Connection: Approach the subject through resources that generate emotional activation.
- Initial social: Promote interaction with others about the subject of the course, with high control by the professor.
- Individual database: Individual approach to the subject through scientific literature, which favours internalisation.
- Social current cases: Cases that are currently of interest are used to reinforce connection and motivation.
- Asynchronous social: Promote interaction between the actors of the environment on the subject, through documents or cases that are currently relevant.
- Individual closure: Implementation activity of the topics developed with the purpose of promoting internalisation by each student.

The proposed activity was developed in groups. Six groups were organised in the course, which consist of four or five people. The groups formed are small, so that the interaction is significant (Johnson et al., 1997).

2.2. Role assignment

As previously mentioned, the role is a social construction that emerges in the interaction and defines the behaviour of the actors (Goffman, 1959, in Gómez, Shafirova, 2016). The interaction is then the place or moment in which the roles are defined.

Considering the above, first the role that each student would play was identified first and then the groups were organised. The roles were assigned according to the answers that each student gave in a characterization form, about how they react to certain situations and their preferred activities. Table 3 presents an extension of Table 1, with the forms of reaction and preferred activities associated with each of the roles.

Table 3. Characteristics associated with each role

Role	Definition	Characteristics	
		Reaction	References
Distributor	Analyses and distributes activities among their peers	Proposes Searches	Plan Follow up
Transcriber	Records everything that happens while the proposed task is being developed	Searches Analyses	Implement Write
Compiler	Prepares the assigned work reports	Analyses Proposes	Organise Write
Reviewer	Audits the process	Compares Proposes	Read Follow up

Source: Mena-Guacas, 2018

2.3. Interaction assessment

Each of the six groups formed had a group on WhatsApp for the development of the activity. In these groups, a total of 1,136 messages were issued by the students, which are the data used to assess the interaction.

Table 4. Values to quantify the quality of the interaction

Category	Points assigned for each participation	Maximum possible points
Parallel	1	5
Two-way response	1	5
Opinion	3	15
Reactive	26	78
Complete	104	Any number greater than 104

Source: Mena-Guacas, 2018

The frequency of the interaction was assessed based on the number of messages issued by each student and the quality based on the categories presented in Table 2. Each message issued was assigned to one of the categories and then the total score for each student was calculated using Table 4.

The score calculation was done considering the following points, as defined by Mena-Guacas (2018):

- The categories are organised ordinally, so that the quality of the interaction is greater the closer it is to the parallel category.

- It is necessary to define a maximum number of possible points in each category, because continuing to interact in the same one only increases the frequency, not the quality.

- Start with the minimum number of points possible, that is, 1. This value is assigned to the parallel and two-way response categories. It is not zero because that would indicate that there is not even an approach to the other person, but in the first two categories that approach does happen. The maximum was defined at 5, because there is no significant contribution from the two parties.

- In the opinion category, an effort to make a significant contribution is already perceived, which is why it has a higher rating than the previous one, specifically 3. The calculation of the maximum possible points was made keeping the same proportion given in the first two categories (1:5), so in this case the highest possible score is 15.

- In the reactive category there is already an interaction that really contributes to learning because there is coherence between the messages and arguments. This indicates that there is joint construction. In this sense, it is a level that cannot be reached if you interact only in any of the previous categories. Thus, it starts with 26, which is a number greater than the sum of the possible maximums of the previous three categories. To show that someone has definitely managed to place themselves in this category, they must interact at least three times in a reactive way. Therefore, the maximum score is 78.

- Interacting in the full category implies that there is already a conversation of more than two messages with coherence and arguments. This means that this level is qualitatively superior to the previous ones, and this must be reflected in the score. It is defined as 104 because it is greater than the sum of the maximum possible score of the previous categories. There is no maximum limit because the greater the number of interactions with this level, the greater the possibility of learning.

2.4. Correlation

To answer the question, a correlation analysis was conducted between the two variables with non-parametric tests of comparison of the central tendency, because the role is a categorical variable and the interaction (frequency or quality) is ordinal.

The Kruskal-Wallis test was applied, which allows a comparison between various data sets, because there are four roles (that is, four sets) and each set is independent of the others. If an actor plays a role, then he or she cannot play another at the same time. Then, a post-hoc test was conducted with the Mann-Whitney U test, which is used to analyse the relationship between variables through a comparison between two data sets (it was conducted six times, once for each pair of roles).

Finally, it is worth mentioning that the analysis was done first in terms of the quality and then the frequency of the interaction.

3. Results

The results are presented between the quality of the interaction and the role first, and then between the frequency of the interaction and the role. In both cases, the working hypotheses for the analysis of the relationship between the two variables are:

- Ho: Equal medians: the quality/frequency of the interaction does not depend on the role;
- Ha: Different medians: the quality/frequency of the interaction depends on the role.

3.1. Relationship between the quality of the interaction and the role

Table 5. Kruskal-Wallis test between quality of interaction and role

Error	Degrees of freedom (k-1)	Chi square critical value	Calculated H
0.05	3	7.815	4.977954145

Source: Prepared by the authors.

The calculated H 4.977954145 is less than the critical point 7.815. Therefore, the null hypothesis is accepted, and with 95 % confidence it can be stated that the quality of the interaction does not depend on the role.

Table 6. Mann-Whitney U test between quality of interaction and role

	Compiler vs. Distributor	Compiler vs. Transcriber	Compiler vs. Reviewer	Distributor vs. Transcriber	Distributor vs. Reviewer	Transcriber vs. Reviewer
Calculated Umin	11	25	22	7	10	11
Critical U (0.05 error)	10	10	10	5	5	5

Source: Prepared by the authors.

In all cases, the calculated U is greater than the critical U, therefore, with 95 % confidence, it can be stated that the quality of the interaction does not depend on the role in any of the tests.

3.2. Relationship between frequency of interaction and role

Table 7. Kruskal-Wallis test between quality of interaction and role

Error	Degrees of freedom (k-1)	Chi square critical value	Calculated H
0.05	3	7.815	6.421766626

Source: Prepared by the authors

The calculated H 6.421766626 is less than the critical point 7.815. Therefore, the null hypothesis is accepted, and with 95 % confidence it can be stated that the frequency of the interaction does not depend on the role.

Table 8. Mann-Whitney U test between quality of interaction and role

Test	Compiler vs. Distributor	Compiler vs. Transcriber	Compiler vs. Reviewer	Distributor vs. Transcriber	Distributor vs. Reviewer	Transcriber vs. Reviewer
Calculated Umin	10.5	24.5	22	5.5	4	16.5
Critical U (0.05 error)	10	10	10	5	5	5

Source: Prepared by the authors.

In almost all cases (except distributor vs reviewer), the calculated U is greater than the critical U, therefore, with 95 % confidence, it can be stated that the frequency of the interaction does not depend on the role in any of the tests.

4. Discussion

The data shows that there is no relationship between the role played by the actors and the interaction they conduct in a learning environment. These results are different from those proposed by Pheny, Shun (2009), who found that a role-based game improved class interaction (Pheny, Shun, 2009) and from what was mentioned by Hawkins, Hertlein (2013) who mentioned that these role plays help the social interaction of couple relationships (Hawkins, Hertlein, 2013). This may be so because what really differs in each team role is commitment (Zamecnik et al., 2022), so it is likely that there will be more interaction, but it will not necessarily be of better quality. For its part, this result confirms what was suggested by (Pepkolaj et al., 2020), who found

that when the peer tutoring model is implemented, greater effectiveness is achieved when it is done without specific roles.

It was expected that there would be a relationship between the variables because each role has different responsibilities, and this insinuated that some could interact more and with higher quality than the others. The reviewer role, for instance, oversaw auditing the process and was therefore expected to highlight errors, propose changes, and improve the deliverables – all this implies interaction with the other actors. However, considering that the results show that there is no relationship between the variables, it can also be stated that there is no incidence of the role on the interaction, but rather it works as Salvini et al. (2016) stated: a commitment to collective action (Salvini et al., 2016) of the group as a whole is established.

It is important to mention that the role not only has to do with the activities performed, but also with how they are performed. For example, Duc et al. (2020) found that alternating team interaction with open or closed leadership positively impacts exploratory learning. In the study presented in this paper, the leadership profile was not identified, but it could be an interesting idea in the future. It should also be noted that static roles were defined, and this may be the reason why no relationship was found between the role and the interaction, since the flexibility of the roles can improve the functioning of the team (Byerly et al., 2021). In the same vein, Heinimäki et al. (2021) says that the highest performance groups are made up of people with versatile role profiles.

WhatsApp was used as a communication tool in the team activity because according to Urien et al. (2019), the students' perception of its usefulness could help develop positive attitudes towards work as a team, while according to Hidayah et al. (2021), students do manage to interact appropriately through WhatsApp for the development of academic activities. The data from the research presented in this paper show that there is a positive attitude towards teamwork, since the members of the groups interact with each other continuously, but it is also clear that the interaction of the group is not sustained by whoever plays a specific role but by all together. This can be confirmed because there is no relationship between the roles and the interaction. In an analogous manner, the use of WhatsApp on smartphones can increase student learning by encouraging high-level skills and concepts (Alshaibani, Qusti, 2021), which is also not supported by someone who plays an individual role but by the whole group.

When some students do not actively participate in the course, the professor might think that they will be able to motivate their participation by assigning them a role with responsibilities that require more interaction with their peers. The results of this research show that this strategy would not achieve improvements in the participation of these students. But there would indeed be an improvement in the complete environment, so that the results confirm what was mentioned by Gillis, Taylor (2018) in the sense that defining roles is useful to involve all students when difficult topics are taught (Gillis, Taylor, 2018).

Cole, Griffiths (2007) found that MMORPGs are highly socially interactive environments (Cole, Griffiths, 2007). In this regard, they accentuate the high social interaction in the environment as a whole. As the results of this research show that there is no dependency between interaction and role, it can be said that they confirm the idea of Cole, Griffiths (2007), insofar as any effort to promote social interaction will benefit all the actors involved equally: to the entire environment, not just a few. This is also in line with what was specified by Lee et al. (2011), as it confirms that peer support is a key factor in the entire learning environment.

The results of this research are useful for teachers because they show that learning strategies with defined roles allow the promotion of interaction of the group, but not always of all individuals. The group interaction promotes a positively influence the active learning of all students, as mentioned by Molinillo et al. (2018). For the foregoing reason, an interesting line of research on this subject is the design of didactic strategies that foster interaction.

5. Conclusion

Conducted within a well-structured framework, this research study critically analyzed the intricate interplay between the roles assumed by individuals in a learning environment and the consequential frequency and qualitative dimension of the interactions they achieved. The gathered data distinctly revealed a noteworthy pattern, indicating the absence of any substantial relationship between the specific roles undertaken by actors and the manner in which their interactions transpired within the learning milieu.

An alternative yet equally compelling interpretation of these findings underscores the pervasive positive impact of nurturing social interactions within educational settings. This perspective posits that any concerted effort aimed at fostering meaningful exchanges among participants, irrespective of their designated roles, inevitably benefits the entire educational community. This perspective transcends the individual roles played and collectively enriches the overall learning environment, emphasizing the interconnectedness inherent within educational dynamics.

6. Author contributions

Conceptualization, Andrés Mena-Guacas; Data curation, Andrés Mena-Guacas and Camilo Velandia Rodriguez; Formal analysis, Andrés Mena-Guacas; Investigation, Andrés Mena-Guacas; Methodology, Andrés Mena-Guacas; Project administration, Andrés Mena-Guacas; Validation, Andrés Mena-Guacas and Camilo Velandia Rodriguez; Writing – original draft, Andrés Mena-Guacas, Camilo Velandia Rodriguez, Norberto Díaz-Díaz and María Belén Morales-Cevallos; Writing – review & editing, Andrés Mena-Guacas, Camilo Velandia Rodriguez, Norberto Díaz-Díaz and María Belén Morales-Cevallos.

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