# EXPERIENTIAL LEARNING AND KNOWLEDGE BUILDING IN HIGHER EDUCATION:
# AN APPLICATION OF THE PROGRESSIVE DESIGN METHOD

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Progressive Design Method (PDM) attempts to connect the Experiential Learning perspective with Knowledge Building model. The aim of the present study was to analyse the implementation of PDM in terms of patterns of online participation and interaction, and the relationship between online participation and interaction with participation in F2F meetings. The implementation was introduced in a Guided Practical Experience at the University of Valle d'Aosta, involving 17 students in their 2nd year of a Psychological Sciences and Techniques degree course. Following PDM, the students worked in teams to create a project about the use of digital technology in school or other formative contexts. An online environment, Knowledge Forum (KF), supported the activity with specific areas (views) where students could present themselves, analyse the KB model and share their project. The project was developed in different steps and after each step each team received a feedback from all the members of the community

via KF. The results for participation show a positive correlation between notes written and read in each view, as well as a correlation between notes read between different views. We also found a correlation between Weighted Indregree and Outdegree in each view. Finally, F2F participation correlated with the total number of notes written and read and with the total number of Weighted Indegree and Weighted Outdegree. Implications of these results for PDM implementations are discussed.

## 1 Introduction

Experiential Learning (EL) can be defined as an instructional model that begins with a direct 'experience' involving a learner, followed by reflection, discussion, analysis and evaluation of the experience (Borzak, 1981, quoted in Chavan, 2011). One of the most relevant theories of EL in higher education was developed by David A. Kolb (1984). Kolb's theory foresees four elements: a) Experience, b) Critical reflection, c) Abstract conceptualization, and d) Active experimentation in a new situation. This process represents a learning cycle that can be continually repeated. A concrete experience leads the learner to observations and reflections. These reflections are the basis upon which to build abstract concepts with implications for action, which the person can then actively test. These concepts provide a new knowledge base for the creation of new experiences. Each phase potentially leads to the following phase and builds upon the former.

A limit of Kolb's theory is that it seems to describe EL mainly as an individual process, particularly in the phases of Critical reflection and Abstract conceptualization. One possible further development of this approach could be focused on introducing collaboration into the cycle. With regard to higher education, particularly when the use of digital technology is involved, the literature highlights the idea of "community" as a central tenet of a learning experience, reframed in a socio-constructivist perspective (Garrison & Anderson, 2002).

According to this perspective Scardamalia and Bereiter, from IKIT (Institute for Knowledge Innovation and Technology) at OISE/University of Toronto, proposed the Knowledge Building (KB) model (Scardamalia, 2002; Scardamalia & Bereiter, 2006). KB model is defined through 12 principles that are used to design a community oriented toward creating new knowledge for its members. The principles implement a collective cognitive responsibility distributed among students for the purpose of knowledge advancement: the need to improve existing ideas is the distinctive trait of this kind of community (Scardamalia & Bereiter, 2010).

One way to connect the EL perspective and the KB model is to involve students in a Knowledge Building community that is oriented toward creating new knowledge. Of the 12 principles that define the KB model, the Concurrent,

Embedded and Transformative Assessment principle highlights the relevance of involve students in assessment. This principle states:

"Assessment is part of the effort to advance knowledge—it is used to identify problems as the work proceeds and is embedded in the day-to-day workings of the organization. The community engages in its own internal assessment, which is both more fine-tuned and rigorous than external assessment, and serves to ensure that the community's work will exceed the expectations of external assessors" (Scardamalia & Bereiter, 2010, pp. 10–11).

The principle therefore prescribes that to improve ideas, it is necessary that students be actively involved in a continuous evaluation process of identifying problems as the work proceeds, focusing on the assessment of the knowledge built by the community. In this respect, the research in the field shows that both self and peer assessment can help students to reflect on their own knowledge and to be involved in collaborative learning (Lan, Lin & Hung, 2012).

Scardamalia and Bereiter, with the IKIT group, also developed a technology called Knowledge Forum (KF), in coherence with KB model principles (Scardamalia, 2004). KF is a multimedia online environment created to support knowledge-building activity. It maximizes the ability of members of a community to create and improve knowledge and community organization. The KF database is an emergent self-organizing system, representing at different stages in its development the advancing knowledge of the community. In a KB community, all students take collective cognitive responsibility for generating and advancing ideas that "live in the world", through the public community knowledge space of KF. In this space the efforts to advance the frontiers of the community knowledge require continuous reading, writing, and multimedia productions to contribute and improve ideas (Chen & Scardamalia, 2015).

In the present study we describe the implementation of Progressive Design Method (PDM) in a university course with the support of KF as online environment. PDM can be considered a way to connect the KB model with EL. This method, in fact, can be used to introduce the dimension of collaboration into the different phases of the Kolb's EL theory (1984). In particular PDM is oriented toward involving students in a KB community working toward the progressive elaboration of a project (Experience), with the possibility of receiving distributed feedback from community members through the online environment (Critical Reflection), making a team decisions about the feedback received (Abstract Conceptualization) and implementing the decisions made in a new version of the project (Active experimentation). When considering the implementation of a community in the higher education context, students' participation and interaction of the students are the crucial dimensions to be investigated; in addition, it is important to analyse the possibility offered by the online environment of "blending" participation and interaction in and outside

of the classroom. The research questions of the study are thus the following:

1. What is the pattern of participation among the participants in the online environment?
2. Is the participation in face to face (F2F) meeting related to the participation in the online environment?
3. What is the pattern of interaction among the participants in the online environment?
4. Is the participation in face to face meeting (F2F) related the interaction in the online environment?

## 2 Method

### 2.1 Participants and Background

Nineteen students (16 females and 3 males) attending the EPG (Guided Practical Experience) of Psychology of learning and digital technologies (academic year: 2015-16) were involved in the present study. Two students (females) did not give permission to use their data for research purposes; these students; however, did not write messages in online environment. The final number of participants was, therefore, 17 (14 females and 3 males), all around 20 years of age. The EPG is a course offered to the students in their 2nd year of the Psychological Sciences and Techniques degree course at the University of Valle d'Aosta. Its general aim is to allow students to apply theoretical models studied in ordinary courses to a practical or professional context.

### 2.2 Online environment

The online environment used to support the activities was Knowledge Forum (KF). In KF it is possible to create specific spaces-called "views" that can be used to organize online discussions about specific topics. In each view, a user can insert notes through written text to which graphs and images can be added. These notes can also be connected to one another via links. In this case, the notes are called "build-on" meaning that they represent developments of the knowledge-building activity. Specific applets called "Analytic Tools" allow the activities of the students working in KF to be traced. In the present study we created two kinds of view: Repository views and Interaction views. The first group included the view "KF at school" (where the students could find bibliographic resources about the implementation of the KB model in Canada) and the view "Experimentation Analysis" (where the students could find bibliographic resources about the implementation of KB in the Italian university context). The second group included a view called "Self-presentation" (where members of the community could present themselves), "The KB model" (where

the students could discuss possible advantages and problems of the KB model considering its implementation in Italian schools) and "Design" (where the students could share their project and give and receive feedback from the other members of the community).

## 2.3 Measures

Considering the different research questions we analysed the following variables:

- Participation: we distinguished between Productive Participation (oriented toward sharing one's own ideas with other) and Informative Participation (oriented toward taking ideas from others). Notes written by the students in KF were considered an indicator of Productive Participation and notes read were an indicator of Informative Participation. Teacher activity was excluded from both the indicators.
- Interaction: we considered the builds-on received by each student (Weighted Indegree), as an indicator of "Social Attractiveness" and the builds-on addressed by a student to another student (Weighted Outdegree) as an indicator of "Social Influence". These definitions were derived from Weimann (1994) with reference to Social Network Analysis. Weimann considers Outdegree (ties outcoming from a person) as an indicator of the degree of Social Influence that a student tries to exert in the group. Indegree (ties incoming to a person) is assumed to be an indicator of Social Attractiveness in a communication network, or the extent to which a student in the network has been selected by other student as a relevant discussion partner.
- Participation in F2F meetings: we considered the number of F2F meetings attended by each student as an indicator of this variable.

## 2.4 Procedure

The EPG was organized according to the Progressive Design Method (PDM). PDM is a method developed by the author of the present article, oriented toward supporting the elaboration of projects in a higher education context. We describe here the PDM principles implemented in the situation:

1. Students as members of a KB Community: students were organized within a KB community and worked collaboratively in teams to design a project.
2. Critical Theoretical Model Analysis: The KB model was analysed by students working together in groups to identify the possible advantages and critical aspects in the hypothesis of applying these principles in

Italian schools. Reflections were shared in KF.

3. Critical Case Analysis: students analysed implementations of the KB model in different school contexts to identify points of strength and weaknesses and ideas to improve them.

4. Progressive improvement of the project: the elaboration of the project was organized in steps that allowed the team members to progressively improve their project. The steps were: (1st step) identifying the theoretical model to be used as a basis, the context, the participants, the objectives (in terms of skills to be developed through the project), and a title for the project; (2nd step) defining the phases of work, the timing, the instruments and the resources; (3rd step) choosing the method to be used for assessment and evaluation of the project, in coherence with the previous aspects; (4th step) creating an advertising spot through a video or a Power Point, to explain the reasons for adopting the project by a possible stakeholder.

5. Distributed Feedback: for each step the partial created product was organized in a Power Point presentation and published in KF (except for the advertising spot that received an oral feedback), where each member of the community could analyse the others' team product and provide a feedback;

6. Recursive Design: after receiving feedback in KF, each team was given time to reflect of any ideas that emerged through the feedback and to introduce changes to their project.

The EPG was then developed in eight F2F meetings of three academic hours each, according to the described above principles. Students could continue the online activity also at home.

### 2.5 Data Analysis

Data concerning participation and interaction patterns were collected through a specific software program called Analytic Tools (AT). AT provides summary statistics on the activities in each view in the KF database. In our case, these data included how many notes a participant had written, how many notes a participant had read, and the matrix of reciprocal build-on created. We used this last kind of data to identify the Weighted Indegree and the Weighted Outdegree values for each participants based on the builds-on written. To analyse the relationship between the variables, given the number of participants, we used of Spearman's Rho coefficient for the correlation.

# 3 Results

Question 1 - Table 1
### PARTICIPATION PATTERN IN THE ONLINE ENVIRONMENT

|  | Self-presentation Mean (SD) | KB Model Mean (SD) | Design Mean (SD) |
|---|---|---|---|
| Notes Written | 1.94 (1.40) | 1.82 (2.09) | 1.06 (1.85) |
| Notes Read | 18.12(13.22) | 8.71 (9.26) | 12.12(13.8) |
| Correlation between Notes Written and Read | Rho = .76, p < .001 | Rho = .86, p < .001 | Rho = .70, p < .01 |

As can be seen in Table 1 the notes written (Productive Participation) and read (Informative Participation) are correlated with one another in each view. We have found also a correlation near statistical significance in written notes (Rho=.47, p=.06) between "KB Model" view and "Design" view and a correlation with statistical significance in read notes (Rho=.89, p<.001) between the same two views.

Question 2 - Table 2
### PARTICIPATION IN F2F MEETINGS AND PARTICIPATION IN THE ONLINE ENVIRONMENT

|  | Mean (SD) | Correlation with participation in F2F meetings |
|---|---|---|
| Notes Written in total | 4.83 (3.66) | Rho = .78 p < .001 |
| Notes Read in total | 38.94(29.61) | Rho = .67 p < .01 |
| Participation in F2F meetings | 5.65 (2.52) |  |

The results in Table 2 show that participation in F2F meeting was correlated with total written notes (Productive Participation) and total read notes (Informative Participation).

Question 3 - Table 3
### INTERACTION PATTERN IN THE ONLINE ENVIRONMENT

|  | Self-presentation Mean (SD) | KB Model Mean (SD) | Design Mean (SD) |
|---|---|---|---|
| Weighted Indegree | 0.94 (0.97) | 0.94 (1.30) | 0.35 (0.70) |
| Weighted Outdegree | 0.94 (1.14) | 0.94 (1.60) | 0.35(0.86) |
| Correlation between Weighted Indegree and Weighted Outdegree | Rho = .78 p < .001 | Rho = .58 p < .05 | Rho = .79 p < .001 |

As can be seen in Table 3 we found a statistically significant correlation between Weighted Indegree and Outdegree in each view. We also have found a statistically significant correlation in Weighted Outdegree between the Self presentation and Design views (Rho=.65, p<.01).

Question 4 - Table 4
PARTICIPATION IN F2F MEETINGS AND INTERACTION IN THE ONLINE ENVIRONMENT

|  | Mean (SD) | Correlation with participation in F2F meetings |
|---|---|---|
| Weighted Indegree in total | 2.23 (1.98) | Rho = .57 p < .05 |
| Weighted Outdegree in total | 2.23 (2.68) | Rho = .57 p < .05 |
| Participation in F2F meetings | 5.65 (2.52) | |

Table 4 shows a statistically significant correlation between total Weighted Indegree and Participation in F2F meetings, as well as between total Weighted Outdegree and Participation in F2F meetings.

## Conclusion

The aim of the present study was to analyse the patterns of participation and interaction among participants in the online environment of an EPG, implemented with reference to EL and the KB model. We were also interested in verifying whether participation in F2F meeting was related respectively to participation and to interaction in the online environment.

The results show that, with regard to the pattern of participation in each of the view in the online environment, a correlation exists between notes written (Productive Participation) and notes read (Informative Participation). Writing and reading are therefore interdependent activities in the online environment within a Knowledge Building community. In other words to produce new ideas it is necessary to get information from the other members of the community. At the same time, in order to receive information from colleagues it is necessary also to provide ideas or information to the community. This dynamic is theorized by Scardamalia and Bereiter (2010) in the KB model principle known as "Symmetric Knowledge Advancement". The results show also a correlation near statistical significance for written notes, and statistically significant for read notes between the "KB Model" and "Design" views. This indicates that some students maintain a high level of writing and reading activity in both the views mentioned, while other students remain at a lower level of activity. We can interpret this result by referencing to the perspective of "emerging roles"

in online activity (De Wever *et al.*, 2010; Strijbos & Weinberger, 2010). This perspective emphasizes that learners structure and self regulate their online activity, according to their learning styles, leadings to a number of "emerging roles" that the students assume informally to facilitate, structure and regulate group work. It is possible, then, in the present study, that the students with higher and lower level of participation assumed an "informal role" that determined their level of participation.

Concerning the second question of inquiry, the results show that participation in F2F meetings were related to overall writing and reading activity. Even if the students had the opportunity to connect to others at home using a "blended approach", this opportunity has not been used and then the presence at the F2F meeting was crucial to gain online participation. As suggested by So and Brush (2008) regarding blended learning, a recent trend in distance education research goes beyond defining the concept of distance in terms of physical proximity and places more emphasis on the psychological aspects of distance. If we consider distance as a psychological dimension, several important questions arise: How do learners perceive psychological distance? What are the factors affecting learners' perceptions of psychological distance? How do learners' perceptions of distance affect their learning? What strategies can be used to minimize psychological distance? Our results provide evidence that a psychological distance was present in the activity done at home and prevented online participation outside the F2F meetings. To implement a blended approach, it is necessary to face these issues. So and Brush (2008) found a positive relationship between collaborative learning and Social Presence, which is defined as the degree of awareness of another person in an interaction and the consequent appreciation of the interpersonal relationships (Short, Williams & Christie, 1976). In Communication Mediated by Computer (CMC) Social Presence is the feeling of perception, connection and reaction to being connected to another intellectual entity through a text-based encounter (Tu & McIsaac, 2002). According to So and Brush (2008), to understand the reason for the positive relationship between collaborative learning and Social Presence it is important to note how the feelings of connection and closeness with other students-both implicated in Social Presence- affects an individual's motivation to engage in academic activities. In our case, the students probably perceived a reduced Social Presence when working at home, and were not motivated to use this opportunity.

With reference to the third question of inquiry, our results show a correlation between Weighted Indegree and Weighted Outdegree based on the build-on notes (notes connected). This means that in the same period of activity (in a view) Social Influence and Social Attractiveness are related. This results can be explained by considering that a high level of Social Influence can correspond to

high level of Social Presence in the online environment (because the student has connected to the others a high number of build-on, giving their feedback). This member has greater probability to exert also high level of Social Attractiveness on other members of the community, because they answered to the feedback received by him/her. This interpretation is consistent with the work of Tu and McIsaac (2002), which showed that social context, online communication and interactivity affect Social Presence and that Social Presence influences online interaction. In the meantime, it is interesting to note that the two dimensions are not stable throughout the activity, as showed by the correlation of Weighted Outdegree between two views only. This could indicate that Social Influence and Social Attractiveness may depend on the kind of task proposed in the online activity, for example analysis of the KB model vs. design of a project.

With reference to the fourth question of inquiry we found that attending F2F meetings is related to Social Influence and Social Attractiveness. This result can be connected with the work of Gunawardena and Zittle (1997), suggesting that Intimacy and Immediacy are two concepts associated with Social Presence. Intimacy is dependent on nonverbal factors, including physical distance, eye contact, and smiling. Immediacy is a measure of the psychological distance that a communicator puts between himself or herself and the object of his/her communication. Thus, the presence in F2F meetings can augment one's Social Presence in the online environment, with an effect on both Social Influence and on Social Attractiveness.

In the present study some limits need to be considered: the limited number of participants which could affect the strength of the results, and the prevalence of female vs. males, all coming from only one university. In future investigations it will be important, then, to verify, using PDM, whether the present results could be generalized to courses based on EL and KB model, with a larger number of participants, a different gender composition, and different academic contexts.

The contribution of the present study is the idea that PDM can provide a connection between the EL perspective and the KB model. In particular PDM can be used to introduce the collaborative dimension into the different phases theorized by Kolb (1984)- a) in the Experience, with a development of a project in team; b) in the Critical reflection, thanks to the team analysis of the distributed received feedback; c) in the Abstract Conceptualization, thanks to the decisions made by the team based on the feedback received; d) in the Active Experimentation, with the implementation in the project of the decision made. In this implementation of PDM we have found a positive correlation between Productive and Informative Participation in each view and a correlation between Informative Participation between different views. We have also found a correlation in each view between Social Influence and Social Attractiveness.

Finally, F2F participation correlated with both Productive and Informative Participation and with both Social Influence and Social Attractiveness.

New directions of inquiry can include the analysis of "emergent roles" of the participants in the online activity, through content analysis, in terms of "conversational functions" (Cesareni, Cacciamani & Fujita, 2016). Conversational functions are specific kinds of activities performed within a discussion that are expected to support productive interaction (Wise, Saghafian & Padmanabhan, 2012;). In addition it is possible to use Social Network Analysis to analyse the socio-metric features (e.g degree centrality, betweennes centrality, etc.) of the roles emerged, to understand their contribute in online activity (Mazzoni & Bertolasi, 2012). Another possible direction of inquiry concerns the analysis of the Epistemic Agency (agency oriented to knowledge-building) of the students (Scardamalia & Bereiter, 2010): In this case it is possible to use a specific kind of content analysis (e. g. Cacciamani *et al.*, 2012) to verify if higher levels of Productive or Informative Participation and of Social Influence and Social Attractiveness are related to high levels of Epistemic Agency. Finally it could be interesting to study how to support distance participation and interaction. In this respect, it could be useful to introduce "scripted roles" to the students to promote online activity outside of the F2F meetings (De Wever *et al.*, 2010). Our results on the implementation of PDM along with future research can be useful in designing innovative knowledge building environments for higher education that are focused on the perspective of EL and the KB model and supported by online environments.

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