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Building Knowledge and Collective Goals:
Theoretical model to analyze Impacting Knowledge Builders

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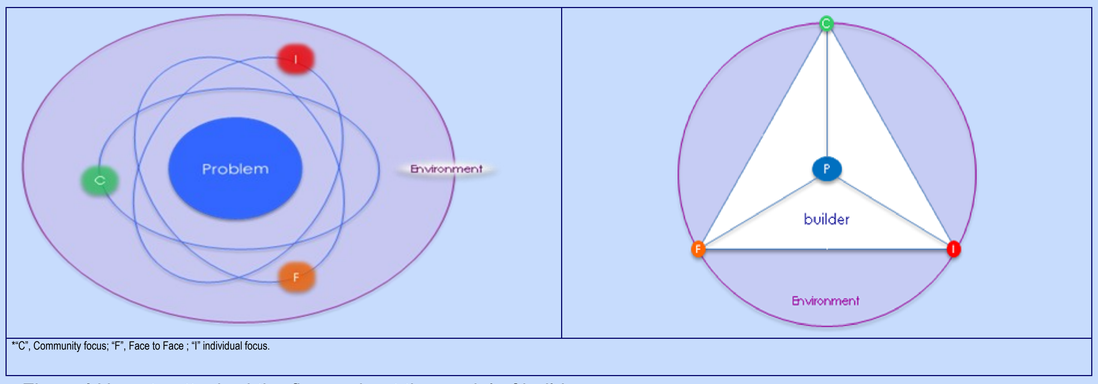
Introduction

Knowledge Building is a framework for the continual revolution of knowledge problems necessary for the transformation, amelioration and progression of a community system. From this standpoint, the community needs knowledge builders that share a common general goal, i.e. to generate knowledge and products that go beyond the system limits of the community (e.g. Bereiter & Scardamalia, 2003). Thus, students need opportunities to be builders of complex problems, and for this reason the educational system's role is to create enabling environments for building activity (e.g. Bereiter, 2002; Scardamalia & Bereiter, 2006).
In this context, we designed a pedagogical model embedded in the Knowledge Building perspective in order to describe knowledge builders and improve their opportunities to be builders. This pedagogical model of knowledge building emerges from the analogy of scientific activity, i.e. how researchers learn and build individually and within their research groups, and then engage, build and create expansive knowledge in research communities focused on their specific field of study.
This Model is based on three interrelated dimensions (environment, problems, and builder activity), each composed of different foci and levels of detail (Figure 1). Builder activity involves reciprocal interactions among the following foci: individual, face to face, and virtual community. The problems dimension involves interactions between: characteristics of the problems (e.g. complexity, contextual opening, feasibility; familiarity, novelty) and demands of the problem (e.g. explore, analyze, comprehension, evaluate, transfer, building knowledge). And environment involves interactions among the following elements (e.g. artefacts, goals, agents, reasons, rules, roles, situation, scaffolds techniques, tools).



*"C", Community focus; "F", Face to Face ; "I" individual focus.

Figure I Have to attached the figure about the model of builders

The present study: Three planes of activity

This study is part of a larger study. The aim of the study was to examine the unidirectional relationship between three foci in the activity dimension (individual, face-to-face, virtual community), in order to ascertain which focus contributes most to relevant builders for the learning community. Path analysis was applied to jointly analyze direct and indirect effects among the variables of each focus.

Methodology

Participants
The participants were 73 psychology undergraduates (71.2% females, 28.8% males) from the Universidad de Granada (University of Granada, SPAIN). They were enrolled in an educational research course as part of a five-year Pedagogy degree programme.
Instruments
Several questionnaires were administered to compile information about the individual and face-to-face foci (the Inventory of Learning Style, ILS, Vermunt, 1998; and the Inventory of Learning Cooperative Patterns, ILCP, Gutierrez-Braojos, López Fuentes, Salmeron-Vílchez, in press). The confirmatory factorial analysis of this solution, using maximum likelihood with oblimin rotation, yielded acceptable Goodness-of-Fit indices. The reliability of each factor was greater than .80.
A Knowledge Forum tool, called Contribution, was used to gather data on the students' participation in the community (reading and building-on) in solving an authentic problem in the knowledge-forum environment. Moreover, Impacting "Builders" was a measure that asked each member of the community the following questions: What were the most important contributions to your learning process? What were the most original contributions of the community? Based on these data, a structural analysis was performed to calculate the relative indices of the reading, the build-ons, and the impact of these constructions on the community.
Finally, students were graded on a test composed of real problems. Thus, the focus of activity and the assessment were aligned.
Environment
This study was designed to create an environment which would facilitate students' building in three activity level. The learning-teaching practices were designed in order for students to internalize skills to cope with authentic problems of educational research through the three planes: individual, face-to-face, and community. Likewise, pedagogical methodology was consistent with the knowledge-building framework and with the knowledge-builder theoretical model. Thus, different pedagogical techniques were used in each of the activity level to facilitate builder activity: portfolio (individual plane); cooperative techniques (face-to-face plane); and scaffolding for collaborative building provided by the Knowledge Forum environment. The authentic problems were presented to the students at every level of activity as a function of each didactic unit of the subject program.
Analytic Procedure
The analytic strategy is composed of follow steps:
(i) Correlational analysis was used to explore possible relationship between three activity foci.
(ii) Equational structural analysis was applied in order to jointly direct and indirect effects

Results

Exploratory Correlational analysis: Relationship between three planes of activity
We applied correlational analysis in order to statically explore the data (Tabla 3). This analysis revealed a significant positive relationship between individual deep pattern and read index (r = .31; p < .01). Likewise build-ons index are closely relationship with read index (r = .53; p < .01) and the community impact (r = .44; p < .01). Additionally, there are negatives significant relationships between individual surface pattern with buildons index (r = - .25; p = .03) and read index (r = -. 38; p < .01). Additionally, there is a negative and significant relationship between face to face surface and dace to face deep patterns (r = - .48; p < .01).
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Table 2. Correlational Analysis: an Exploratory Analysis.

Variables***	1	2	3	4	5	6	7	8
1. Deep I.P.	-							
2. Surface I.P.	-.147	-						
3. Deep FTF.P.	.149	.055	-					
4. Surface FTF.P.	.055	.056	-.477**	-				
5. Reading C.	.308**	-.381*	.115	-.020	-			
6. Build-on C.	.190	-.250*	.090	-.036	.533**	-		
7. Impacting builders	.080	.-167	.128	-.167	.218	.443**	-	
8. Test Grade Subject	.327**	-.264*	.212	-.229	.472**	.636**	.581**	-

** p< .01; * p<0.05

Path Analysis: Direct and indirect effects between three plane of activity

The correlational analysis conducted to applied path analysis in order to test direct and indirect effects between the three planes of activity. Direct and indirect effects showed that the activities of the three planes are connected in order to explain impacting builders and test grade (Table 1, Figure 2).

Figure 2. Path analysis: three pane of activity *

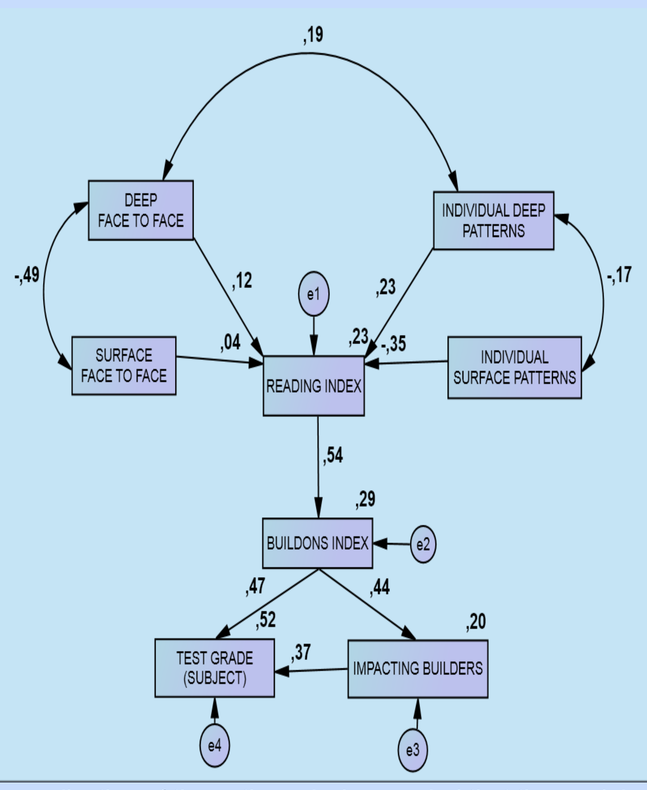

Table 3. Standardized Direct, Indirect and Total Effects

Effects	Direct	Indirect	Total
On Grade Test Subject			
Impacting Builders	.372	-	**.372**
Build-on	.471	.165	**.636**
Reading	-	.341	**.341**
Surface Pattern Face to Face	-	.015	**.015**
Deep Pattern Face to Face	-	.041	**.041**
Deep Pattern Individual	-	.080	**.080**
Surface Pattern Individual	-	.121	**-.121**
On Impacting Builders			
Build-on	.443	-	**.443**
Reading		.237	**.237**
Surface Pattern Face to Face	-	.010	**.010**
Deep Pattern Face to Face	-	.029	**.029**
Deep Pattern Individual	-	.056	**.056**
Surface Pattern Individual	-	.084	**-.084**
On Build-on			
Reading	.535	-	**.535**
Surface Pattern Face to Face	-	.024	**.024**
Deep Pattern Face to Face	-	.064	**.064**
Deep Pattern Individual	-	.126	**.126**
Surface Pattern Individual	-	-.190	**-.190**
On Reading			
Surface Pattern Face to Face	.044	-	**.044**
Deep Pattern Face to Face	.120	-	**.120**
Deep Pattern Individual	.234	-	**.234**
Surface Pattern Individual	-.354	-	**-.354**

*The application of the path analysis revealed that the model show a good fit.

Results showed a significant and positive covariance between deep patterns (Individual and Face to face). However individual deep pattern was more important than face to face activity in order to explain community plane activity. Concretely deep pattern of the individual plane contributes significantly and directly to the read activities and contributes indirectly to build-on activities. Moreover reading and build-on activities (community plane) were the most important in order to explain impacting builders (see table 2). Finally, we consider important to note that the three planes and impacting builders contributes strongly to test grade subject.

Discussion and conclusions: Collective goals?

In general, our results indicate that three levels (individual, face to face and community) explain the impact on builders and test performance. The individual level was the most relevant in explaining reading and build-on activity in the knowledge-forum environment, whereas the community environment was the most relevant in explaining the impact on builders and test performance. However, face-to-face activity was less relevant than expected. In other words, this results indicate that belong to a cooperative group which present a deep pattern (face to face activity focus) isn't sufficient to present a deep pattern of participation in community (asynchronous activity), students need present a deep pattern in their individual activity too.
Moreover, our results indicate that students who exhibit high activity (reading and activity) in the KF obtained a greater impact than those with a sporadic activity. This makes sense because they have a greater presence and know more by "where the knowledge go", while the network knowledge grows. However those students with a sporadic activity, often lose the thread of the discussion, and in these circumstances is more difficult for them to generate build-on relevant to the knowledge network.
We thought that face-to-face activity should have been more important than theses results indicate, because this activity and community activity are based on shared cognition theory. However, these similarities were not upheld in this study. Asynchronous working was found to have characteristics which were more compatible with individual activity than with face-to-face activity. In other words, these results indicate that membership in a cooperative group which has a deep pattern (face-to-face activity plane) is not sufficient to present a deep pattern of participation in community (asynchronous activity). That is, students need to present a deep pattern in individual plane activity, as well.
We explored the reasons that could explain these results. The main reason appears to be that students' individual and asynchronous activity shared individual goals whereas face-to-face activity membership shared collective goals. Therefore, we conclude that students and teachers did not generate a community level when there were collective goals. We hypothesise that the evaluation system inherent in our institution's educational system (environment) was responsible for these results, because students' activity on the individual and community level was analysed and evaluate individually. The analysis of the face-to-face plane was focused exclusively on collaborative group activity and not individual efforts in their groups.
Moreover, the results indicate that students who exhibit high activity (reading and build-on) in the KF achieved greater impact than did those with a sporadic activity. This makes sense because they have a greater presence while the knowledge network grows. However, the students with sporadic activity often lost the thread of the discussion, and under these circumstances it was more difficult for them to generate build-on relevant to the knowledge network. In these results, it is true that the amount of individual activity is related to the quality of individual activity.
In sum, we consider it especially important to design an environment in which students work in the three planes in order to generate an opportunity to be builders of knowledge. Also, the teacher is required to analyse and evaluate the potential builder in each of the activity levels, with the aim of indentifying ways of improving the potential builders.

References

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