Learning how to learn together (L2L2): Developing tools to support an essential complex competence for the Internet Age

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Abstract: Learning to learn together (L2L2) is a complex competence requiring that all the group members are able to coordinate, regulate and plan the learning task by balancing issues of individual ability, motivation and expectations through constant dialogue. In this paper we report on a project to define the complex competence of L2L2 and to support it with a set of web-based tools and associated pedagogy, the Metafora Project. The system we develop embodies our theory of L2L2 and the results of our design-based research suggest that this system can succeed in making key elements of L2L2 explicit in the talk and actions of groups of learners.

Learning how to learn (L2L) is often referred to as the most important knowledge age skill since it equips people to adapt flexibly in a time of rapid change (OECD, 2001; 2004). However, we argue that the reality of Internet mediated learning is more about learning how to learn together (L2L2) with others than about learning to learn as an individual. L2L2 goes beyond L2L because it combines the dimension of task management, (how to organise complex inquiries with multiple stages and strands) with the dimension of social relationships (working with attitudes, expectations and identities in order to participate constructively in learning as a collective accomplishment). In this paper we report on a project that attempts to define the complex competence of L2L2 and to support it with a Metafora system (Wegerif et al, 2012), which includes a planning and reflection tool; a dynamic concept mapping space (Loll et al, 2011) and a chat, and associated pedagogy. In the first part of this paper we characterise L2L2, presenting elements of our design framework for teaching L2L2 and in the second part of this paper we describe design-based research used to test and refine the theory of L2L2 presented in the first part and to develop the working Metafora system.

Part 1: Characterising L2L2

Transferable learning skills and competences such as L2L have mainly been understood as the attributes of individuals. L2L2 is different because it is primarily the attribute of a group or collective. We hope that individuals who participate in one group acquire skills and competences that they can take with them when they go to work with other groups. However, these skills and competences are essentially social and do not exist outside of social interaction. Viewed through the analytic lens of the group, L2L2 is about group norms that support distributed leadership, mutual engagement, peer assessment, and collective thinking.

Teaching skills and competences to groups can be understood as a form of intentional culture change (Cobb & Bauersfeld, 1995; Wegerif, 2002). This process can be partly understood using a modified version of a commonly used schema in the teaching of individual skills: the process of moving from unconscious incompetence, through conscious incompetence, to conscious competence and on, eventually, to unconscious competence (Howell, 1982). The implicit norms of the culture in a classroom can be changed in a similar way. One important difference between teaching individual skills and changing cultures is that cultures are people plus tools including communications technology. This means that the tools that support communication within a culture are not only scaffolds that will fade away as new skills and competences are learnt but these tools can also be essential enablers of collective thoughts and actions (Pea, 1993). The Metafora system is designed to serve a dual role of supporting the teaching and learning of L2L2 and supporting the continuing practice of L2L2. This means that it provides tools to help make group norms explicit and change the culture but it also provides tools to help groups that are already good at L2L2 work together effectively and creatively.

In the first stage of this pedagogy the groups are made aware that they need to coordinate their work together but are not sure how best to do this, this initial stage is called the ‘challenge’ when they are presented with a complex problem. Explicit tools are provided by the Metafora system to support them. These tools, especially icons representing aspects of L2L2 (Table 1), make some of the implicit norms followed by effective groups, explicit. In the full system icons, representing aspects of L2L2, are combined with dynamic concept mapping spaces for discussions (LASAD, see Figure 2), microworlds and a pedagogical strategy.

Component	Explanation	Visual
Activity stage	Key stages of dialogic inquiry-based learning process, e.g. Explore, Reflect on process	

Component	Explanation	Visual
Activity process	Key activities to concretize the process of each activity stage, e.g. Report, Anticipate	
Attitude	Key intersubjective orientations to specify the group attitudes during activity stage and process, e.g. Critical, Ethical	
Role	Key roles to manage and mediate collaboration and cooperation between learners and groups, e.g. Manager, Evaluator	
Resource	Available resources for activity stages and processes, e.g. Group discussion map, Microworld artefact, etc.	
Connector	Key relationships between all the components, e.g. causal relationship, temporal relationship	

Table 1: Six Components of a visual language for L2L2

To unpack the complexity of the L2L2 competence, four key aspects are emphasised in our design of technology and pedagogy.

(1) **Encouraging distributed leadership moves**: Distribution of leadership in groups has both social (e.g., Crow, Hausman, & Scribner, 2002) and situational (e.g. Steed, et al, 1999) aspects. Each activity stage of the visual language represents a snapshot of the group learning situation, which reveals a need for different kinds of leadership distribution pattern. This awareness of distributed leadership around particular topics breaks down dominating coalitions, hierarchical relationships, social exclusion and isolation.

(2) **Mutually engaged through/around shared objects**: Shared object/artefacts provide a rich repertoire of referential anchors for mutual engagement and understanding. The shared model of the group learning process which is made explicit using the visual language plays a crucial role in supporting mutual engagement and creating a shared framework for collaboration.

(3) **Peer assessment for group awareness**: We argue that ability to take different general attitudes is a prerequisite for successful group learning, for example taking a creative attitude to attempt a speculative approach. The 'Attitude' components of the visual language offer students an opportunity to anticipate and consider what their likely responses might be, and implicitly, to consider any difference between the ideal response and their likely response.

(4) **Group reflection on the social dimension of learning**: To make this process of knowing explicit to the group, we identified three distinctive temporal opportunities for group reflection around an online discussion map:

Beginning: Reflecting on individual preferences, collective responsibility and intended level of participation.

Middle: Reflecting on emerging roles, norms and gaps between individual and collective outcomes.

End: Reflecting on original group learning interpersonal structure and emergent structure, intended individual learning outcomes and achieved outcomes.

Part 2: Design Based Research on the theory of L2L2

The theory of L2L2 described above was embodied in the first iteration of the Metafora system combining the visual language (Table 1), a dynamic concept-mapping dialogue space, microworlds and pedagogy. The exact format of each design-based research case study varied across the partners (in the UK, Spain, Israel and Greece), but all involved a class of students using Metafora tools (e.g. a planning and reflection tool, a discussion map tool and a chat) to solve a complex challenge. During the study, we video recorded groups working around computers. We then interviewed the participants in an open-ended way about their group learning experience. We analyzed the data to identify the emergent L2L2 themes relating to the four key aspects of L2L2 using interpretative discourse analysis influenced by socio-cultural discourse analysis. When possible we also used Key Event Recall analysis (Wegerif et al, 2010).

Results

Four examples selected from our different case studies illustrate how the Metafora tools and associated pedagogy support awareness of L2L2 towards the 'Conscious Competence' stage of culture change. Learners between 13 and 16 years old worked together after having been given a learning challenge that implied they had to plan and organise their learning together.

Episode 1: Distributed leadership moves around the planning and reflection tool

This episode is a group of students using an online chat to discuss how they should conduct their co-construction activity in a Microworld called eXpresser (Mavrikis et al, 2012), after they have use the tool to plan how they should allocate roles.

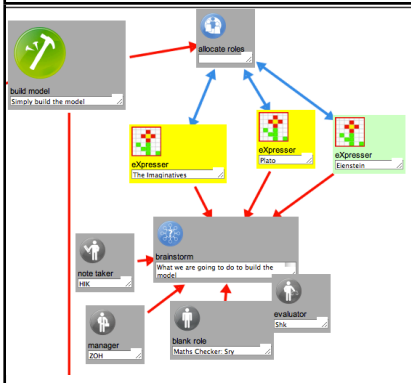
Role allocation with the visual language	Role negotiation in the chat
	ZOH: how many blue tiles have u got SHK: we have to coordinate with each other HIK: you seriously expect me to count them all? ZOH: yes ZOH: SRY you have to work with NOO HIK: ok, ZOH, you make sure the animation's coloured ZOH: ok SHK: and me? HIK: SHK, you check that the aniamtion works without messing up SHK: ok HIK: And I'll make sure the computer's model is coloured HIK: then we'll decide about the pattern later SRY: what shall i do? HIK: you'll have to discuss that with NOO, SRY SHK: oh right HIK: So ZOH, you're doing the My Model colouring, And I'm checking that the Computer Model is coloured.

Figure 1: Take responsible for different kinds of leadership moves

This discussion indicates an understanding of the function each one assumes when working together. Both the shared plan and the chat reveal that different students were responsible for different kind of leadership moves, for example, SRY was acknowledged at being better at the mathematical aspect of task, whereas SHK showed more managerial leadership moves.

Episode 2: Mutually engaged to elaborate the process of group learning

This episode is a group of students engaged in a dialogue around their visual model of group learning process. This dialogue demonstrates how Metafora visual language promoted and mediated the reflection about scientific process to solve the task.

Aln: so, in theory we are still here. We have not done anything, right? ((laughs))
Ada: yeh ... but from this, we should do an experimental design shouldn't we? Or something.
Aln: if
Ada: This is experimental design, right? [[looking for experimental design icon]]
Aln: wait, wait, wait. First are the hypothesis
Ada: We put and if we do better steps to follow first, and observe second
DNLA: if ... and reflect as well. Now we are reflecting, aren't we?
Aln, if also
Ada: thinking ...
Aln: here and to reflect put an arrow. So, after everything we've done we look in the mirror. Can I do it? ... [[requested photocopies of the icons in the DNLA]]

Episode 3: Peer assessment to co-construct a discussion map

This episode illustrates how the different 'attitudes' given icons in the visual language extend the group's capacity to create ideas and assess each other's ideas

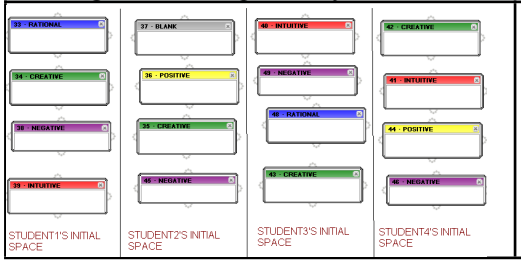
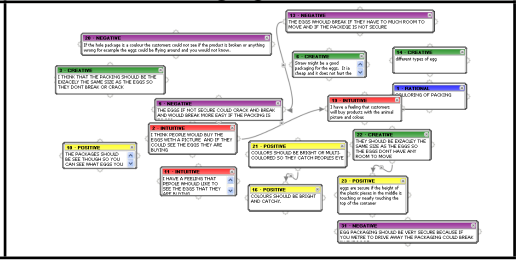
1st stage: Work independently with attitudes	2nd stage: peer review
	

Figure 2: From independent thinking with attitude to co-construct a collective discussion map.

In the post focus group discussion, we found an improved understanding of how to learn together in a web-based environment.

Interviewer: Were these colours useful?
Charlie: Yes, they are all very useful, because you knowing what people are talking about. Sometime, you might find someone could write something in a blank one, you can think is it positive or something else?

We could find that the attitude types offered the students a way to structure their thinking together process, not in terms of the ideas, but in terms of the attitude they took to approach to the questions and tasks.

> Henry: I will put all our negative ideas on the top.
> Rose: Yes, I think we could delete No. 17, because it is the same idea to the No. 13. They are both about 'secure the eggs'.
> [[Rose pointed to the shared screen and Henry deleted text box No.17 as Rose asked.]]

Episode 4: Advancing ideas through an group reflection

This episode illustrates how interchangeably using different Metafora tools together enable a group of UK students to "*move their ideas bigger and better*".

> Researcher: Do you think discussion before planning helps you plan?
> Rose: Yes, definitely. We all have ideas, we all spoke about our ideas and in plan we move our ideas bigger and better, because we have all talked about it.
> Charlie: Yes you can look at LASAD and see your ideas again, and write down in the text boxes in the plan. Because you can change ideas and you can put extra ideas in.

By analyzing the video data, we find that continuity of children's experience of using the discussion mapping tool and the planning and reflection tool nurtures their reflection on their group learning process both at concrete level (i.e. task specific ideas) and abstract level (i.e. the visual language, the task general process).

Conclusion

This paper unpacks four key aspects of learning to learn together (L2L2) and proposes a visual language which was embedded in the web-based Metafora system to help enculture its users toward successful group learning . In most classrooms, learning to learn together requires culture change. The four episodes of Metafora-supported collaborative learning shown as illustrative example of our design-based research demonstrate how the four aspects of L2L2 are experienced by the students mediated by the external representations of group learning model and group discussion space. Such collaborative activities around these shared objects allow the new norms of L2L2 to become implicit over time as groups practice learning together in response to challenges in maths and science. The system we developed embodies our theory of L2L2 and the results of our design-based research suggest that this system can succeed in making key elements of L2L2 explicit in the talk and actions of groups of learners. Further research is continuing to explore the changes over time that happen in the use of metafora. Our hypothesis is that the use of explicit reminders and supports for L2L2 will reduce gradually as aspects of L2L2 become implicit within the shared culture of groups and classrooms.

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