

Jigsaw Method in the Context of CSCL

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Abstract:

Group techniques and methods show great promise with respect to the learn effect in Computer Supported Collaborative Learning (CSCL) resulting from the perspective of cognitive elaboration, the construction of shared knowledge and the possibility of multiple perspectives. However, previous results in the research of group techniques in online learning were not very extensive. Therefore we started a jigsaw in CSCL in the context of the federal flagship project, "Virtual University of Applied Sciences for Technology, Computer Sciences and Business Administration" (VFH). During the course of "Environment oriented Management" (EoM) we tested the different assumptions and suppositions regarding the effect of the jigsaw method. In the case study we focused the evaluation on the degree of collaboration and the influence of the group method. The result was that jigsaw proved to be an efficient method to intensify collaboration in CSCL. To achieve this certain conditions have to be considered. Aspects like group cohesion, individual competence, and awareness, have a significant influence on the result of the jigsaw.

Introduction

Teamwork is strongly associated with high degree of effectiveness and efficiency. The apparent evidence toward the superiority of cooperative vs. individual work is also transferred to the area of learning. It is widely accepted that, "cooperative learning is supporting the success in learning in general" (Pfister & Wessner 2000, pp.140). As plausible as this statement appears, you can also state that: "you can decide neither theoretically nor empirically which social form of learning and working is better" (Reinmann-Rothmeier & Mandl 1999, p.4). Both negative and positive effects within the area of Computer Supported Collaborative Learning (CSCL) can be proven empirically in a relatively effective manner.

A way to stress the positive aspects and to minimize the negative ones is to use group work techniques. In the context of the course "Environment oriented Management" (EoM), which was conceived and produced for use within the federal flagship project "Virtual University of Applied Sciences" (VFH), a group work technique called jigsaw was implemented. The cooperative task to complete was structured using this method. A jigsaw uses a redundant group structure: main groups and expert groups. The group task can only be completed with the knowledge acquired in the expert groups, and thus with the intensive cooperation of all team members.

CSCL – arguments and implications

As positive impacts and arguments speaking for CSCL, three positions are taken into consideration. These positions are particularly scrutinized for their feasibility and their implications regarding the use of the jigsaw method.

Cognitive Elaboration

The possibility of cognitive elaboration in cooperative settings is valued positively and used as a main argument for the necessity of CSCL in the psychology of learning. In general one can assume that new information can be linked with the existing schemes only after it has been restructured and elaborated. One of the most effective processes of elaboration is the explanation of the learning matters from one's own point of view. Therefore teaching is the most effective way of learning. This fact is conceptualised as the perspective of cognitive elaboration (e. g. Slavin 1993).

But the explanation of the learning matter relates only slightly, or has no impact at all on the learning success of the recipient (Webb 1991). The advantages lie rather clearly on the person who gives the explanations.

Thus, a structure needs to be created which makes explanation possible for all group members – independently from group status and individual competence. Within this context the main starting point is the creation of the task. If designed as a jigsaw, one can assume that explanatory processes, independent from the status, are to be stimulated.

Multiple contexts and perspectives

Relevant for CSCL are the demands on the learning settings and the task formulated by instructional research. Significant matters include: authentic and situation-based learning settings, social and multiple contexts and multiple perspectives.

Within the framework of multiple perspectives, a learning situation is created so that the learner possesses the various possible perspectives of the task. During cooperating the group members are supposed to take the perception of the other group members. Thus, alternatives can be identified and rated. As one can see, the learning goal is much more than just the acquisition of factual knowledge.

Multiple perspectives should exist in cooperative settings, however a contention with divergent positions is not inevitably necessary. Group members can, for example, ignore existing diverging opinions. Dealing with multiple perspectives should thus be anchored within the learning task as well. The jigsaw should be an effective way not only to make multiple perspectives possible, but also to present them as necessary for solving the learning task.

Construction of shared knowledge

A further reason for the use of CSCL is propagated in the situated learning approach. Within this context learning is conceived as an active, self co-ordinated, situated and constructive process.

Additionally, learning is primarily considered as shared knowledge construction (e.g. Derry, S. J. & DuRussel 1999). Cognition and the acquisition of knowledge are socially divided activities and thus referred to the use of co-operative learning scenarios like CSCL.

Indeed, the social context is necessary, however, it is an insufficient basis for the construction of shared knowledge. Intense interaction and the construction of shared knowledge must be specifically promoted. Using the jigsaw could be one possibility for that purpose.

Jigsaw Process

Jigsaw is one method which makes the interdependence of group members possible, promotes interaction and cognitive elaboration, takes into consideration the principle of the multiple perspectives and contexts as well as the construction of common knowledge. In the following the course EoM will be used as an example (see Fig.1) to present the different phases of the jigsaw process (Clarke 1985, Clarke 1994).

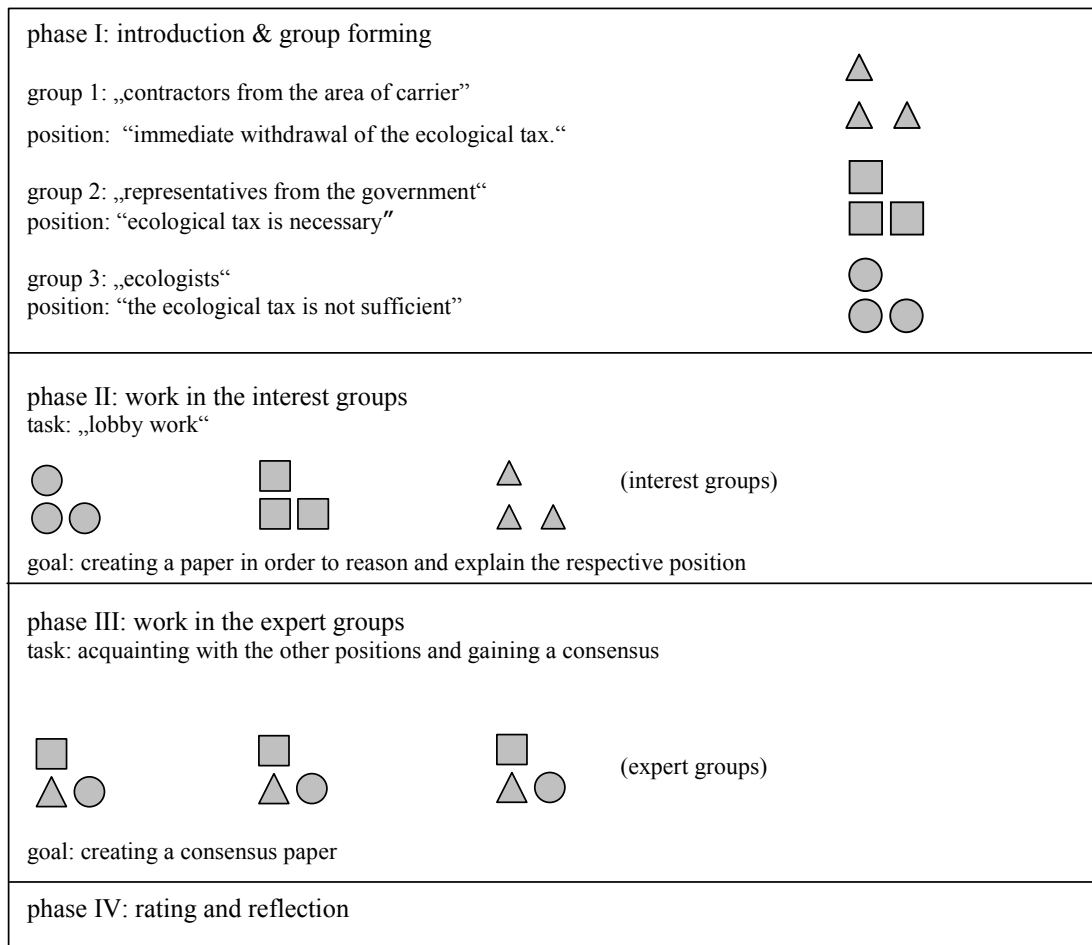


Figure. 1: Phases in the process of the group task

After the introduction of the topic, the learning materials were divided into sections (phase 1) and the learners were divided into interest groups, which independently compiled a section of the material (phase 2). Thereby different parts of the material are covered by different interest groups. In the module EoM, the theme ecological tax was processed by three different interest groups, which each had another emphasis as well as a divergent view on the problem. The basic positions were sketched up in advance.

The first task was to identify with the position alleged for the group and to collect arguments and pieces of information to support it. From these considerations, according to the theme of ecological tax as well as from the view of the respective group, a position paper should be prepared, in which the point of view of the group is written up along with background information.

To produce multiple perspectives the participants should likewise consider how the other groups could argue their perspectives and include this in their discussions. An essential aspect was the construction of shared knowledge through intense interaction within the group. Additionally, cognitive elaboration was necessary in those areas where the focus was on bringing together the divergent opinions for the respective position paper.

In the third phase new groups were formed based on the chance principle. The scenario was an expert conference initiated by the government. At these „meetings“ in which the different points of view on ecological tax were discussed, agents of all interest groups participated. For that purpose the participants had to acquaint themselves with the position papers of the other interest groups. After that the pros and cons of the individual positions were analyzed and discussed. At the end of the discussion, each group had to find a consensus and outline a course of action for the future. In a written summary the consensus found, as well as the course of action along with the underlying arguments were to be presented.

The third phase particularly intensively included the three implications mentioned above. Here, taking multiple perspectives was imperative. To prepare a common consensus paper, the participants had to take the other positions and try to understand their argumentation. Here the cognitive elaboration became more important than in phase 2. The participants had to explicitly explain the arguments for their positions in the groups. The main point is that the possibility to give an explanation is not bound to the status and/or to the competence of the participants. To achieve an adequate result, all participants had to take in turns both the role of the teacher and the role of the learner. All these processes required intense interaction and led to the construction of common knowledge.

The fourth phase included the evaluation and reflection of the results. For that purpose the consensus papers of the „expert meetings“ were made accessible to all course participants. The participants were to read the consensus papers of the other expert groups and to give their opinion to the produced results. Additionally, they were asked to reflect on the group work itself, as well as on the jointly compiled results.

Evaluation

The empirical foundation of cooperative learning methods is largely fragmentary in Germany. Systematic comparison investigations to the employment possibilities and effectiveness controls are not widely available (Giesen 2001). Still more deficits can be seen in the research situation with respect to the employment of the jigsaw method in the area of CSCL. According to Friedrich, a.o. (Friedrich & Hesse 1999, p.126) „*the suitability of this (...) can first of all only be assumed*“.

Inasmuch as the module „EoM“ has been introduced in a small scale up to now, first locally in the pilot mode of the VFH, the evaluation refers more to the current status. The primary goal of the formative evaluation was to draw qualitative statements, which refer concretely to improvement possibilities. The main question was how deep the degree of collaboration was and how the degree of collaboration was influenced by the group method.

Results

Thus, the main question was whether the group cooperation can be considered as sufficient. The majority of the participants (53%) answered this question negatively and a lower value was reached. Therefore it seems that the expectations for the concept were not realized. On the other hand, there were also explicit positive statements like; „*The group dynamic inspired me*“ and the „*Shared responsibility for the result*“. There were seen as an advantage. It was also mentioned, that the, „*creation of the consensus paper as a conclusion [...] made a lot of fun*“. Considering all these facts the concept of the division of work was rated positively. This is supported by statements like „*the result crystallizes out by putting all these different pieces together. Everybody helped to put the pieces of the puzzle together and the picture got its shape from various views*“. This statement emphasized the main features of the jigsaw method like cognitive elaboration and construction of shared knowledge.

How can this contradiction be explained? First of all, the result regarding the cooperation in the groups must be seen in a relative terms. Here different aspects play a role. One the one hand, the degree of collaboration in virtual groups is considered to be relatively low. Lack of cooperation is also dependent on the deficits in the computer mediated communication. The evaluation of the other CSCL projects within the framework of the VFH pilot phase produced results that generally stated that the cooperation was perceived by the majority, in part or even by the entire group, as not close enough. Thus the value in the EoM module is comparatively high.

Basically, there was a lack of awareness, i.e. of the mutual perception and based on this of the group cohesion. The production of awareness, tersely defined as „knowing what is going on“(Endsley 1995, p. 36) is a problem that has social effects and also refers to the responsibilities of the members and groups. In pure virtual group work, basic social information is often missing. This information usually is gained in the presence phase at the beginning of the course which has at least the implicit goal of getting to know one another. Providing this information likewise on a homepage or a „wanted poster“ still remains not to be an optimum solution. For example there was the reference: „*I would like to know more precisely who the other persons are. But I don't like this to do through homepages. I surely won't like to present myself completely in the www.*“

After all, it remains difficult to find optimal solutions to quickly create a confident atmosphere and intense group cohesion that is purely computer based. One aspect are the students references that the lacking social cohesion can possibly be met in advance with a, “*virtual getting-to-know-game*”. Another possibility to make getting to know each other informally possible would be “*by providing different chats about different themes at the beginning of the course* “. But all together it can be noted that the students of the pilot phase of the VFH did not or just hardly knew each other prior to the group work. There were no informal contacts like the ones they develop during a longer regular course of study at a virtual university. This aspect was also emphasised by the participants: “*One should get the chance to get to know the coursemates better (thus on-line over a longer time period). To my mind the social aspect plays (even under the criticism of the "loneliness" in front of the monitor) a substantial role*”. However here the opinions differ. The statement that one of the central advantages of CSCL is that: “*Due to the lacking social contacts one does not become distracted from the actual group work*” shows that the expectations for group work are quite different. Thus it remains to see whether and how the problems appears in the regular teaching of the VFH.

A further complementary aspect that led to a partial negative view of the co-operation, was the lack of time. Processes, for example the discussion about the common knowledge background - the so-called “grounding” (Clark & Brennan 1993) - which contribute to a smooth co-operation, require a larger time framework especially for virtual groups where they take place through computer mediated communication (cmc). The lacking grounding was also stated particularly regarding the cmc: “*I think that several clear formulations (e.g. 'I do not consider this as practicable') will be taken seriously through email or they will even be taken as provocative. The personal verbal expression, which in Emails is usually transferred more casually than it would be the case in formal letters, is experienced as 'stronger'. Clear statements are often experienced as provocative and responded accordingly. Thus, unfortunately, a front quickly develops*”.

The time aspect is especially important for groups, because the phase of optimal performances, begins relatively late. Accordingly, the „*short time frame provided*“ and the „*time pressure*“ were mentioned as difficult aspects.

In conclusion one can say that, “*in this virtual learning atmosphere - although there is a set of communication aids available, - it is quite more difficult to find a consensus than in a real course where you can meet personally for one or two hours*”. The intended processes of negotiation requires intensive interaction, therefore they need an adequate time framework.

Another aspect that showed up rather indirectly was the partial overtax of the participants with self-controlled learning. The participants have considered the autonomy, provided while dealing with the task, rather to be a lack of guidance than a chance for self-controlled learning. Therefore the lack of “*concrete clues*” was criticized. The need for strong guidance becomes clear in the following statement: “*Everyone was working on the first draft deleting paragraphs, adding new notes with different colours and asking and/or answering questions within the same document. Thus the document became very meaningful, however it was no longer clearly arranged. I would have liked it better if there had been a concrete rule for everybody which states that, first of all, everyone has to provide his/ her own version/ approach in which the results of his/ her own internet-research are presented*”. Here the adjustments to the learning process as before appeared to be a structured and rather receptive process. Unfortunately, the self-controlled learning forms are usually less accepted than it would be didactically desirable. In particular it was shown that the positive effects of the jigsaw, in this concrete case of the shared knowledge construction, were existent but were also not always perceived as helpful.

Conclusion

All in all the result is an ambivalent picture. The jigsaw method is not only feasible on-line but also as a meaningful learning method. The advantages such as perspective change, intensive interaction with items of cognitive elaboration and co-construction of knowledge were clearly recognizable. These advantages were mainly assumed as positive by the students.

A principal requirement for successful CSCL is accurate scheduling and precise formulation of the task. In addition it is also useful to offer enough material and sources for background information.

Another condition for the effective realization of the jigsaw is the consideration of the basic conditions. Like each good learning method the jigsaw is not successful by itself. Three basic conditions played a substantial role in the case study.

One focal point were the group cohesion and the social awareness as central items of the procedure. These can be treated in different ways. On the one hand, one could execute a presence phase before the CSCL that helps to overcome the communication barriers and thus relieve the group identification.

On the other hand, with purely virtual group work it should be considered how implemented awareness supporting tools can facilitate the social, spontaneous and informal interaction and thus improve the cohesion in the group.

In addition to form groups and to perform the relatively complex task a larger time framework is required for communication, co-operation and co-ordination.

A final aspect, which should be considered likewise more specifically for the realisation of jigsaw, includes the individual capabilities and competences of the learners. Experience and knowledge of the students taking courses in further education are very heterogeneous. Collaborative learning also covers processes of self-controlled and self-organized learning. These abilities are differently distributed. There are different learning types for which CSCL is well suited however there are other for which it is less suited. Finally it can be considered to implement a graded tutoring and structuring quasi "on demand".

Therefore the jigsaw is a very good method to initiate positive processes of collaborative learning in the CSCL. This also showed up in the case study. As it is the case for all complex learning forms, the organization and counterbalancing of the multiple basic conditions and factors, remain an iterative process of optimization. This offers further opportunities for empirical research, which may concern the concrete learning success needed.

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