Investigating How to Group Students based on their Learning Styles

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Abstract

This study involved 21 students who constructed individual and group concept maps on the central concept of "Computer Storage Units". The purpose of the study was to investigate how learning styles and knowledge influence group collaboration.

1. Introduction

In Adaptive Educational Systems, the goal of the adaptive collaboration support technology [1] is to use system's knowledge about different users to form a matching collaborative group. Thus, an interesting approach would be to use the learners' learning style information for organizing learners in groups as this characteristic is considered to influence individual work as well as social interaction. However a critical issue is which models to select and how to use them. We agree with Coffield [2] that "in the current state of research-based knowledge about learning styles, there are real dangers in commending detailed strategies to practitioners…. There is a need to be highly selective.".

In the context of adaptive collaboration, the social dimension of learning as well as the nature of the task on which learners collaborate are critical issues in selecting learning style models. In our case, the task that learners need to collaboratively undertake is the construction of a concept map. A concept map is comprised of nodes, which represent *concepts*, and links, annotated with labels, which represent *relationships* between concepts, organized in a structure (hierarchical or non-hierarchical) to reflect the central concept of the map. The triple Concept-Relationship-Concept constitutes a *proposition*, which is the fundamental unit of the map. A map may also include cross-links, which are relationships between concepts in different regions/ domains within the map, and examples clarifying the meaning of a given concept [7].

Based on this context, we chose to investigate two different learning style models: (a) the Honey and Mumford [5] categorization (based on Kolb' learning cycle, Honey and Mumford built a typology of Learning Styles: activists, reflectors, theorists and pragmatists), which concentrates on how people learn and deals with the social dimension of learning, and (b) the visual/verbal dimension of Felder-Silverman [3] model mainly because of the nature of the concept mapping task – learners need to graphically organize and relate concepts in a map.

Aiming to avoid the "danger of labeling people as 'theorists' or 'pragmatists', when most people exhibit more than one strong preference" [2], we characterize students based on their strong preferences (if any) on the different styles and not based on their max value on one of the styles, i.e. a student may be characterized as Activist-Reflector or average on the four styles. Moreover, we acknowledge levels of the visual/verbal dimension, i.e. a student may be characterized as high/average/low visualiser/verbaliser.

The results of this preliminary study will support the development of a group formation module that could be incorporated in an adaptive educational system that supports collaboration.

2. Empirical Study

2.1. Sample & Procedure

Twenty-one undergraduate students, enrolled in a semester-long course entitled "Didactics of Informatics" at University of Athens, participated in this study. The 21 students were placed in seven groups (three students per group). Specific groupings were intentionally made to create a combination of similar and dissimilar learning styles following Honey and Mumford's categorization (H&M) and/or the visual/verbal dimension of the Felder-Silverman model (F&S). Students were asked to complete both learning style questionnaires outside of class. As an in-class activity during the session, students were given an

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individual concept map assignment. They were asked to act as tutors preparing a concept map (paper-and-pencil) concerning the central concept of the "Computer Storage Units" for a high school class. This map would be used as a didactical tool during the corresponding course. Then, students organized in groups and collaborated in constructing the group concept maps for the particular concept. In this case, students were asked to act as tutors and collaborate with colleagues for the same target. For the group concept map construction, students were asked to use the COMPASS environment [6] and to consult their individual concept maps.

2.2 Data Analysis

To investigate how learning styles and knowledge influence group collaboration, the data obtained from the learning style questionnaires, the individual as well as the group concept map assignments were used to evaluate students' knowledge, group performance and level of interaction between individual and group.

Evaluation of students' knowledge level and group performance. The students' knowledge level was evaluated based on the individual concept map assignment. The evaluation scheme applied is a variation of the algorithm proposed by Novak & Gowin [7] according to the aims of the assignment. The group performance was evaluated based on the group concept maps. A similar evaluation scheme was followed in which the number of significant correct propositions, the number of significant correct cross-links and the hierarchical levels used, were taken into account. As significant propositions and cross-links, we consider the links between concepts that fulfill the aims of the assignment and appear in most students' group maps.

Level of interaction between individual and group. On the basis of Stoyanova & Kommers' work [8], the evaluation of the level of interaction/influence between individual and group concept maps was based on individual to group transfer and rejection at group level.

3. Results and Discussion

Three different clusters of groups were identified: (a) groups with average levels on the four H&M styles; (b) groups with students having a strong preference on various H&M styles, i.e. students with various learning styles; (c) groups with students having a strong preference on one or two H&M styles, i.e. representative of the particular learning styles. Groups belonging to the first cluster had better performance compared to the rest ones, whilst groups of the third cluster had the worst performance. In the first two clusters, having better performance than the third one, students' groupings were based on a mixture of H&M learning styles, including cases with average (groups of the first cluster) or strong preference (groups of the second cluster) on the different styles. It may be that these groups consisted of more balanced learners as 'no single style has an overwhelming advantage over any other. Each has strengths and weaknesses but the strengths may be especially important in one situation, but not in another' [4]. It is interesting to notice that among the groups of each cluster, the most productive were those with higher levels of visualisers.

The influence of each member of the group on the group concept map was evaluated by an expert (see Section 2.2.2). In three groups, students with higher levels of knowledge seem to influence more the group map. However, in many cases students with the same knowledge seem to influence differently the group map based on their visual/verbal dimension, i.e. those with higher levels of visual dimension seem to influence more the group map. Moreover, there were also cases in which students with low knowledge and high visual level had greater influence on the group map than students with higher knowledge. It may be that visualisers work better with graphical representations.

4. References

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