A DESIGN AND DEVELOPMENT OF DISTANCE LEARNING SUPPORT ENVIRONMENT FOR COLLABORATIVE PROBLEM SOLVING IN GROUP LEARNERS

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ABSTRACT

The competency and curriculum for human resource development in knowledge based society are proposed in each country. We think the keywords are "collaborative problem solving" and "effective use of ICT". In particular, the competency to perform the collaborative problem solving and learning with others on the network is requested in next generation. We have developed a learning environment in which multiple learning supporters support the learning process asynchronously from the remote site and have been performing educational practice. The advantage of distance learning support is that they are able to get more time to consider the goal and method of learning support and the role of each learning support. However, it was hard to grasp the state of group learner's learning activity and knowledge understanding, when there were few utterances to the learning activity of the learner on the learning environment. Therefore, the purpose of this study is to propose a Goal Setting-based Collaborative Problem Solving Learning Model (GoLaPS model) , in which group learner performs the learning process of task-analysis and task-solving based on goal setting, and develop a tool to support the group learner in the model. In this paper, we explain the structure and the learning process of GoLaPS model and the function of the developed tool based on the model.

KEYWORDS

Goal Setting-based Collaborative Problem Solving Learning, Task Analysis and Solving, Learning Supporter (Distance Teaching Assistant), Collaborative Learning Support Strategy and Method, e-Pedagogy

1. INTRODUCTION

The competency and curriculum for human resource development in knowledge based society are proposed in each country. We think the keywords are "collaborative problem solving" and "effective use of ICT". In particular, the competency to perform the collaborative problem solving and learning with others on the network is requested in next generation. The research of e-Pedagogy which explore the learning and education model of next generation in knowlege-based society have been developed. We have developed a learning environment in which multiple learning supporters support the learning process asynchronously from the remote site and have been performing educational practice. The advantage of distance learning support is that they are able to get more time to consider the goal and method of learning support and the role of each learning support. However, it was hard to grasp the state of group learner's learning activity and knowledge understanding, when there were few utterances to the learning activity of the learner on the learning environment.

Considering the background of our study, the purpose of this study is to propose a Goal Setting-based Collaborative Problem Solving Learning Model (GoLaPS model), in which group learner performs the learning process of task-analysis and task-solving based on goal setting, and develop a tool to support the group learner in the model. In this paper, we explain the structure and the learning process of GoLaPS model and the function of the developed tool based on the model.

2. GOAL SETTING-BASED COLLABORATIVE PROBLEM SOLVING IN GROUP LEARNING

Many Learning models to raise the ability for problem solving many solutions have already been designed and carried out in the world. In the problem solving, it is effective to get a solution while combining goal-driven backward reasoning with data-driven forward reasoning. In particular, it leads to an effective solution to the problem to make a task clear while learners perform a goal-task analysis and to share a role or solve collaboratively for the task in the case of the collaborative problem solving with group. Moreover, it's not easy to grasp the learning state and understanding state of learner or group when they asynchronously support the learning from a remote site. Therefore, the learning goal and the task of group and each learner, the item and state of the work and the role of learner are an important resource to support the learning process from a remote site on the Internet. In this study, we propose the GoLaPS model (Learning model to perform Goal Setting-based Collaborative Problem Solving, see Figure 1) as a learning model to make it easy to grasp the situation of the learning activity of the group learner who perform a problem solving in a face-to-face meeting or on the Internet collaboratively.

The GoLaPS model defines the problem solving structure and provides the activity process including task analysis and solving for each factor of the structure. The activity of the group learners is constructed from two phases (*Task-Analysis phase* and *Task-Solving phase*). In Task-Analysis phase, they extract some task items to achieve the learning goal given by the teacher and decide a task solution procedure by arranging the tasks in a turn to be settled. Moreover, they extract some work items to solve each task and decide a work procedure by arranging the works in a turn to be carried out. In Task-Solving phase, they advance the activity towards achievement of the learning goal by performing himself/herself or collaboratively each work in the work procedure of each subject item acquired in the Task-Analysis phase.

The characteristic of the GoLaPS model is that group learner progress with task or work solving effectively by sharing the task, the work and the task solving plan or the work procedure. We think that the problem solving ability of the learner improves by visualizing their information. On the other hand, we think it becomes easier for learning supporter to grasp the situation of the learning activity of the group learner by this model.

We need to prepare the following function to carry out the learning process based on GoLaPS model;
+ The function to explicitly display the task and work items provided in the Task-Analysis phase
+ The function to visualize the solving process for each task and work
+ The function to grasp the situation of the group learning activity
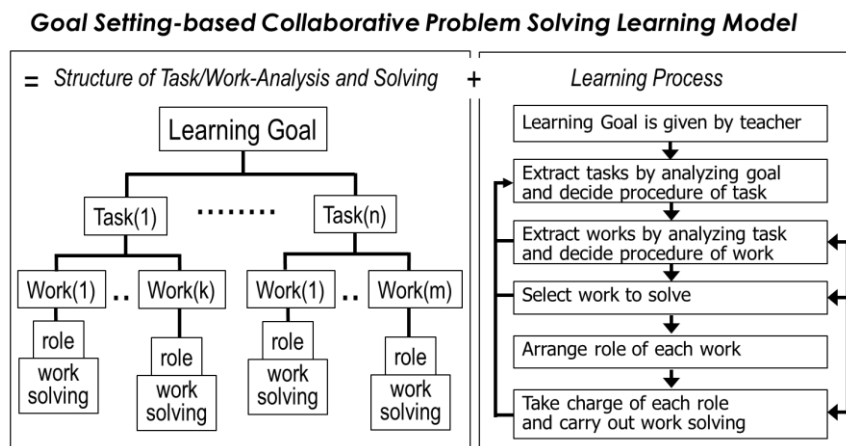+ The function to activate the communication among learners and between learner and learning supporter

Figure 1. Structure and Learning Process of GoLaPS Learning Model

3. DEVELOPED SYSTEM BASED ON GOLAPS MODEL

We have designed and developed a system (GoLaPS system) which can carry out the task and work solving typed learning based on the GoLaPS model (See Figure 2). The system needs to prepare the individual workplace for each learner, the workplace where a group works and the workplace where learning supporters supports group and individual learning. Furthermore, the workplace of group activity requires the workplace where the group learner makes the learning plan (Task/Work-Analysis) to a learning goal, and the workplace the group learner solves the extracted tasks and works. The design policy of this system is as follows;
[Design policy of system]

- We constitute a GoLaPS system so that each workplace may be classified as one Web page.
- Each learner who belongs to a group tackles activity on the Web page ("Group Page") prepared for every group.
- We consider the constitution of the GoLaPS system in which the member of group can go back and forth from the Group Page ("hub page") on which they has some activities to "spoke page" by adopting a "hub & spoke" method.
- In order to make group activity smooth, we change a communication function into the "talk form" which is easy to build the relation interaction from the "bulletin board form".
- We introduce the function to make the load which a learner and a learning supporter check various logs reduce, in order that they can join the problem solving of the group smoothly, even when they take part in it asynchronously.
- We constitute a GoLaPS system the learning supporter supports a group and each learner through "question / proposal thread (Question/Proposal Page)".
- Since the learner is used to getting to know the information of a person from the individual page prepared in SNS, we offer a "Personal Page" in the same form.

Figure 2 shows the relation of all the pages in the GoLaPS system. A learner logs in to Personal Page first. She/he can describe private information such as self-introduction in Personal Page. Although the thread form was adopted as the description of self-introduction in the old system, it was not easy for learner to check the log with progress of time. So, Personal Page is offered in the same form as SNS in this system. Furthermore, Personal Page is provided with the WALL function for supporting a student individual. Then, the learner moves to Group Page which is Hub Page of this system. There are four phases in group activity. The learner uses "Task/work-analysis sharing tool" in the Task/Work-Analysis Sharing Phase. Furthermore, the learner uses "LINE typed communication tool based on utterance intention" in order to opt for the extraction and procedure of the task and the work in the Task/Work-Analysis Phase. The learner's question and the proposal and comment of the learning supporter use Question-Proposal Page in the Learning Support Phase. After identifying the item of task/work and determining the their order, the learner uses a Work-Solving Page in order to carry out each work in the Work-Solving Phase. The learner can ask learning supporter a question also in this phase, and the learning supporter supports work solving of the learner or group.
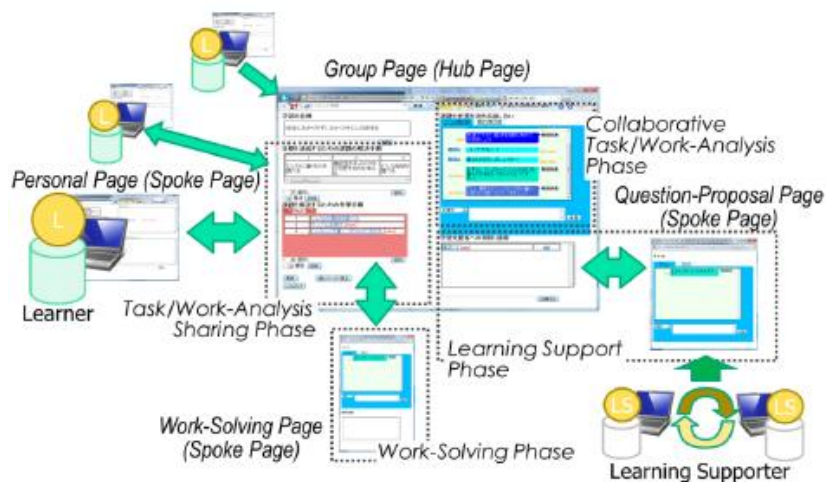

Figure 2. Relation of all the pages (including relation between Hub Page and Spoke Page) in GoLaPS system

We explain about the function of main tools or page in the following subsection.

3.1 Task/Work-Analysis Sharing Tool

It's important for each learner to recognize that what kind of procedure the group considers in order to attain the goal, what kind of task/work the group tries to solve, how the work solving of the group is and what the role of group member is in the collaborative task solving. The Task/Work-Analysis Sharing Tool has two functions which visualize the task/work analysis result and work solving process of a group based on these four important things. By utilizing this procedure analysis tool, a learner can experience the process of analyzing the task/work structurally. As a result, we expect the problem solving capability can be improved. Furthermore, we try to become for learning supporter easier to grasp the situation of learning activities by making the result of the task/work analysis of a group visualize.

Figure 3 shows the screen image of the Group Page. Procedure analysis is divided into three layers in the task/work-analysis sharing phase of the Group Page. The upper "learning goal" is the achievement standard which a group should realize through learning and problem solving; for example, "make a manual to master the smart phone new learners". The learner is able to revise the learning goal. The part of middle layer is that the group learner describes the solving procedure of the task for attaining the goal; as an example, "an item required for a manual is investigated", "the tool which new student uses is investigated". When a learner specifies the number of the work, the learner can add or delete it. The learner describes the work procedure for solving the task in the lower layer. Addition of a work solving procedure will also add the tab of the number of work procedure. The learner can add or delete the work. The workplace of work solving is linked as a Work-Solving Page to the title of each work. The learner can advance to the Work-Solving Page by pushing the work button. The Work-Solving Page has the chat function and the summarized function for solving a work, and the function of the question / proposal to a learning supporter.

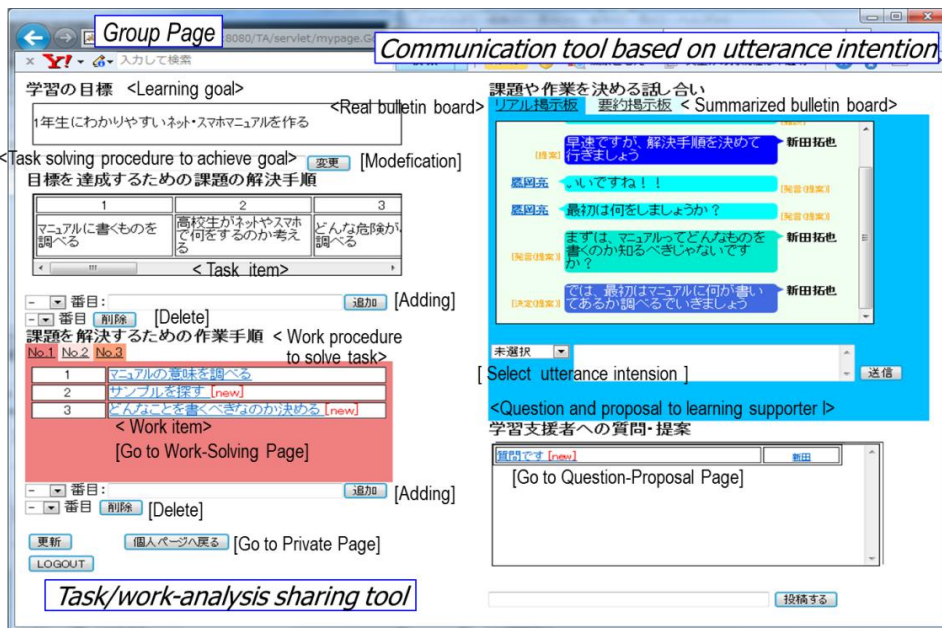## 3.2 LINE Typed Communication Tool Based On Utterance Intention

Figure 3. Interface Image of Group Page in GoLaPS systemFigure 1. Structure and Learning Process of GoLaPS

The communication tool implemented in this system aims to display a user's utterance in the same talk form as LINE, and to impress conversation or discussion like actual utterance by displaying learner's name and blow-off. The real bulletin board and the summary bulletin board as a communication tool are prepared in Group Page, Question-Proposal Page and Work-Solving Page. In the real bulletin board, the learner's

utterance is displayed on a time series as a log. In the summary bulletin board, the learner's utterance is summarized and displayed on the time series.

When the learner speak in the real bulletin board, it is necessary to choose an utterance intention. We expect the effect of clear and logical argument, if the learner indicates an utterance intention clearly. Furthermore, we think this system can support group discussion or argument from the series of an utterance intention in the future. Now, we have eight utterance intentions.

- Proposal: this intention is selected when a learner has a proposal for the group.
- Reply (proposal): this intention is selected when a learner replies to a proposal.
- Conclusion (proposal): this intention is selected when a learner speaks a judgment and a conclusion to a proposal.
- Question: this intention is selected when a learner asks other member of group.
- Reply (question): this intention is selected when a learner answers a question.
- Solution (question): this intention is selected when a question has been solved.
- Summary: this intention is selected when a learner summarizes the old logs about commented content simply.
- Chitchat: this intention is selected when a learner has a chit-chat.

The summary bulletin board has a function which displays two or more utterances collectively in order to make the load of a log check reduce. The learner can make a list of the object to summarize by clicking one or more buttons prepared in the learner's utterance. Furthermore, the learner can attach a label to a series of utterances for a topic. The summarized contents are displayed under the label by clicking them. This summarized log can be used also for reflection. By this function, even when a learner participates asynchronously, we expect the learner advances various activities smoothly.

4. CONCLUSION

In this paper, we explained the structure and the learning process of GoLaPS model and the function of the developed tool. In the future, we will do sequentially the learning experiment and improve this model. Moreover, it is necessary to design and develop a collaborative learning support tool.

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