

The relationship between instructor's scaffolding and students' metacognition in online academic course

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This research studies the relationship between instructor's support and students' metacognitive thinking in an online academic course on democracy and multiculturalism. The study aims to examine and characterize the nature of students' reflective thought processes in online forum, as well as to explore various types of support provided by the instructor. Seven hundred students' postings in the course forum were content analyzed using the metacognitive tool for analyzing students' reflections (Rimor & Kozminsky, 2001-2002). Students' reflections distributed among three metacognitive dimensions: Personal, Task, and Strategy. The instructor's postings were analyzed using a new tool for analysis of online "scaffolds", which was developed for this study. Analysis of instructor's support identified four types of scaffolds provided for the students in the forum: metacognitive, content-centered, structural, and technical support.

Data analysis reveals positive correlations between students' metacognitive dimensions and instructor's scaffolding types. Task dimension of students' metacognitive thinking was significantly correlated with all types of instructor's scaffolding. Students' metacognitive dimensions were all correlated with content-support type of instructor's scaffolding. The importance of metacognitive processes to learning in online environment has been considered and suggested previously. Our findings indicate statistical correlations between instructor's feedback and student's metacognitive response, and hence support their relationship in the forum.

Introduction

The main goal of this study is to investigate the relationship between students' metacognitive reflections and instructor's scaffolding in an online academic course.

The importance of online feedback provided by the instructor is in the focus of our present study. Such feedback and guidance can function as a system of scaffolds that may promote the reflective and metacognitive learning processes.

We aim answer the following questions:

- a. How to characterize student's reflections?
- b. How to characterize instructor's support?
- c. Is there a statistical relationship between student's reflections and instructor's support in the forum?

Theoretical background

Educators have long considered metacognition to be an important part of teaching and improving one's learning (Flavell 1979; Paris & Winograd, 1990; McCrindle & Christensen, 1995; Nelson, 1996; Nason, Anderson, & Nielsen, 2005). Recently, interest in metacognition has greatly increased among researchers studying students' reflections in online learning environment (Anderson, 2001; Barbour & Collins, 2003; Rimor & Kozminsky, 2001-2002; Papaleontiou-Louca, 2003; Davis, 2003; Nir-Gal, Nur, Gelbart., & Reingold, 2005; Lehman, 2006).

The importance of assessing reflection processes in an online course deserves a special emphasis. The online forum is often conceived as a space for exchanging thoughts and feelings in the course of studies. Consequently it may constitute a unique and valuable tool for documenting and examining the links between teaching, learning and the processes of reflection. The online forum seems particularly suited for deriving metacognitive indices based on the easily obtainable and comprehensive protocol of learners' explicit written reflections. We assume that in this type of environment the learner needs to employ reflection as a mechanism of feedback and self-support (Rimor and Kozminsky, *op. cit.*).

In addition, it has been shown that when students do not receive any external feedback regarding their progress from the course instructor they fail to initiate metacognitive processes and their basic learning achievements in the course are low (Bugbee & Berent, 1993). Vygotsky emphasized the importance of teachers' support to the development of the learners (Vygotsky, 1978). Some more recent researchers claim that the online environment can be an optimal platform for teacher's support (Jonassen, 2000; Nir-Gal et. al. 2005; Nehama., Kalay & Rimor, 2005). The online forum involves participants' reflections about task content and demands along with personality and social factors. Students are exposed to instructor's feedback and guidance, collaborative interaction, as well as information about other people's performance and affect.

The present study extends the investigation of students' metacognitive thinking to the examination of its relationship with instructor's scaffolding in online academic course. We are particularly interested in studying the types of online support provided by the instructor, in relation to students' metacognitive reflections in the forum. We assume that such feedback and guidance can function as a system of scaffolding that may promote the reflective and metacognitive learning processes (Efklides, 2006).

Method

68 Students participated in the online course: "Democracy and Multiculturalism". They were Israeli and Palestinian teachers who worked in Bedouin and Jewish schools in Israel. The online course was part of their annual accreditation program.

The course forum aimed to encourage students to move from ethnocentric perspectives to multicultural ones, through reflection upon reading of academic materials and through dialogue in a multicultural community of learners.

The current study is based on qualitative and quantitative methods. Content analysis of students' responses was initially employed in order to reveal students' metacognitive dimensions, using The MCSR tool (Rimor & Kozminsky, 2001-2002). We analyzed students' reflections according to Flavell's metacognitive dimensions: 1) personal, 2) task, 3) strategy (Flavell, 1979), along with twenty two metacognitive indices of the MCSR tool for analyzing reflections of online learners.¹

In addition, we identified types of scaffolds provided by the instructor, using the categories of a previous tool for analyzing Instructor's scaffolding in technological-based environment (Nechama, Kalay, Rimor, 2005). Content analysis revealed four types of instructor's scaffolds:

1) technical 2) content-centered 3) procedural and 4) metacognitive.

The tool's categories were re-defined and shaped according to the content of the discussion, the purpose of the forum, and the characteristics of the course. Analytic categories for theorizing the data emerged from the participants' answers, rather than being imposed by the researcher upon the data. Through this process of

categorical coding as it emerged, we worked to establish credibility of the findings, along with reliability among judges (Glaser and Strauss, 1967; Nardi, 1996).

As the data was coded into emergent categories, these categories, together with their properties, became the basis for the Tool for analyzing Instructor's Online Scaffolding" (TIOS), and for theorizing the findings.

1048 written messages were produced in four forums. Postings by students were discarded from the analyses if they were determined not to be related to the metacognitive indices of the Metacognitive tool for Students' Reflections (MCSR). This produced a total of 700 postings written by the students. An analysis of these postings using the MCSR tool categories (indices) represents the students' reflections in the forum. Frequency of metacognitive indices was figured according to reflections occurrence within each category of the tool.

In addition, we analyzed 66 forum postings written by the instructor, using "Tool for analyzing Instructor's Online Scaffolding" (TIOS), which was previously described and is presented in the following results (see table 2).

Statistical analysis was operated in order to explore correlations between students' metacognitive dimensions and instructor's types of scaffolding.

¹ See: description of the tool's indices in: <http://burdacenter.bgu.ac.il/publications/finalReports2001-2002/Rimor.pdf>

Results

Our findings present the distributions of students' metacognitive reflections and instructor's scaffolding types, as well as their statistical correlations.

The distribution of the metacognitive indices indicate that students' reflections were mainly expressed through personal insights about themselves as learners (48%), as well as insights about their task (46%). Very few reflections were assigned to the strategy needed to accomplish the task (6%). Further analysis revealed that the most salient reflections were concerned with the content of the task (42%) and with emotional expressions (28%) related to learning in online environment and to the forum community (17% positive and 11% negative emotional expressions, as shown in the following table).

Table 1: An analysis of students' reflections in the online forums*
Frequencies of metacognitive indices (in percentage).

A. Personal Indices	Description	%
1. Personal Traits	An individual's insight regarding his nature and traits as an online learner	0
2. Cognitive styles	Refers to personal preferences related to methods of navigating/searching/ communicating on the net	0
3. <u>Emotions Total:</u>	Expressions of emotion in regard to searching for data and/or regarding the process of communication on the net:	28 (N= 280)
• Affection	Expressions of affection, consent, satisfaction	13 (N=125)
• Objection	Expressions of objection, anger, dissatisfaction	9 (N=95)
• Communality	Expressions of communality, enjoying forum co-dependency	4 (N=41)
• Frustration	expressions of frustration, hesitation, fear, despair, sense of getting lost	2 (N= 19)
4. Achievement	Referring to personal achievement, to progress/no progress.	0
5. Request for response	Referring to time of response, request for response, request for patience	5 (N= 51)
6. Relating to the presence of the other	Examining the presence of the other on the net in the course of discussions in the forum	15 (N=155)
	Total Personal Indices	48 (N = 486)

* Based on the Meta Cognitive tool for Students' Reflections (MCSR). Rimor & Kozminsky, 2001-2002; Rimor, 2002).

B. Task Indices		
1. Characteristics of data sources	Monitoring of the quality of data sources, assessment of the precision, the credibility and the "up datedness" of the data and the web sites	
2. Availability of data sources	Monitoring of availability of data sources in relation to the search's aim	0
3. Relevancy	Assessment of the relevance of the data found, in relation to the user's aim	2 (N= 18)
4. Problems and difficulties	Description of problems and difficulties in the course of carrying out the task	1 (N=7)
5. Feasibility of performance	Monitoring of necessary resources for performing the task such as: time, place, communication, hardware and software	0
6. Contents	sharing personal insights about the task content, new data, new ideas, prior knowledge	42 (N= 416)
7. Characteristics of the net environment	Relating to the structure and functions of the internet (the infrastructure of web sites, search engines, links, and asynchronous communication).	2 (N=18)
	Total Task Indices	47 (N=459)
C. Strategy Indices		
1. Planning	Planning strategies for carrying out a specific task on the net	0
2. Choosing and implementing a strategy	Choosing and implementing a strategy for data searching	0
3. Assessment of results	Assessment of search results on the net of data and sites	0
4. Monitoring and revisions	Correcting and changing a previous strategy	0
5. Explanation	An explanation or rationale related to the data search and/or the process of communication on the net	1 (N=9)
6. Reaching conclusions, generalization	Expressing a personal opinion or conclusion regarding a task, strategy, and work on the net in general	1 (N=11)
7. Requesting help	Requesting help from another person in relation to functioning on the net	0
8. Helping	Helping another person following a request for help	0
9. Referral	Referring to sites and resources providing help without requests	4 (N=36)
	Total Strategy Indices	6 (N=56)
		(N=1001)

The following table indicates the distribution of four types of supports provided online by instructor.

Table 2: Distribution of Instructor's types of scaffolding in the forums, in Percentage(N=66).

Scaffolding types	Operational definitions of instructor's online scaffolds	%
1. Technical support	Technical instructions for working in online environment: internet, Forum ,Database etc.	
total		9
2. Content support	Adding information, Elaborating and correcting information	
	Correcting writing and verbal articulation of response.	
total		25
3. Procedural support	Assisting in data handling: search, organizing and representing data	
	Presenting course site map, and the links between site, course topics, and specific session.	
total		23
4. Metacognitive support	Presenting rational for task and activities	
	Presenting the relationship between reading items, course objectives and tasks	
	Supporting reflective writing	
	Discriminating between conclusion/fact/ opinion/hypothesis	
	Supervising text comprehension	
	Focusing on the process of learning	
	Encourage relationships among participants.	
total		43

Table 2 illustrates the four different types of scaffolding used by the instructor and their frequency in the forums. In addition, scaffolding average score was computed for each student based on all the instructor's feedbacks and support addressed to him/her in person. Metacognitive average score was computed as well for each student across all his/her postings in the forum.

Spearman's correlation between instructor's scaffolding and students' metacognitive scores demonstrated a significant correlation between them. The instructor's overall scaffolding score was highly correlated with the students' metacognitive scores ($r=0.497$, $p<.05$).

Table 3: Average scores of each metacognitive dimension and scaffolding types

	M	Sd	N
Personal	7.33	8.14	491
Task	6.96	4.38	466
Strategy	0.96	1.88	64
Technical	0.09	0.29	6
Content	0.19	0.40	13
Procedural	3.24	0.46	217
Metacognitive	5.34	0.81	358

A fine-grained analysis was performed to explore the correlation between each of the four types of instructor's scaffolding and each of the three students' metacognitive dimensions.

Table 4: Correlations between students' metacognitive dimensions and types of instructor's scaffolding

Instructor's scaffolding types	Metacognitive Dimensions		
	Personal	Task	Strategy
Technical	0.223	0.364**	0.129-
Content	0.424**	0.347**	0.321**
Procedural	0.382**	0.314**	0.054
Metacognitive	0.204	0.285*	0.077

$P < 0.01^{**}$ < $P < 0.05^{*}$

Findings in table 4 indicate that the Task dimension of the students' metacognitive thinking was consistently and significantly correlated with all types of instructor's scaffolding (metacognitive : $r = .29$, $p < .05$; content support: $r = .35$, $p < .01$; procedural support : $r = .31$, $p < .01$; and technical support: $r = .36$, $p < .01$). In addition, the Content-support type of instructor's scaffolding was consistently and significantly correlated with all of the students' metacognitive dimensions (Personal: $r = .42$, $p < .01$; Task: $r = .35$, $p < .01$; and Strategy: $r = .32$, $p < .01$).

Discussion

The findings of this study reveal the vital importance of instructor's feedback and support in an online academic course. Our study provides strong empirical evidence to support the relationship between instructor's scaffolding and students' reflective and metacognitive processes. All types of support provided by the instructor found to correlate significantly with students' metacognitive reflections upon their task's attributes and demands. The teacher's scaffolding of students' learning or peers cognitive and metacognitive support can alleviate feeling of difficulty through the instruction or hints that make students aware of critical cues regarding the required information or procedures for the solution of the problem (Efklides, 2006). This study highlights the unique potential of online courses coupled with instructor's scaffolding to promote and study students' metacognitive reflections.

Our findings provide strong empirical evidence to support the relationship between students' metacognitive processes and instructor's scaffolding in online learning environment. A well instructed course promotes metacognitive and scaffolding processes and hence contributes to the success of effective online teaching and learning.

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