Instructor's Scaffolding in Support of Student's Metacognition through a Teacher Education Online Course ─ A Case Study

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Abstract

This study describes the relationship between the instructor's feedback and students' metacognitive processes in an online course on democracy and multiculturalism, which was taught as part of a teacher education program. 700 postings, written by 68 students, were content analyzed along with 66 postings by the instructor, using tools designed for that purpose. A strong positive correlation was found between the instructor's responses and students' metacognitive thinking demonstrating the importance of instructor's feedback in helping to produce an environment in which students would experience learning through reflective and metacognitive processes. Our study highlights the unique potential of online courses coupled with instructor's scaffolding to promote and study students' metacognitive reflections. Implications for the design of teacher education programs are also discussed.

Introduction

Educators have long considered metacognition to be an important part of teaching and improving one's learning (Efklides, 2006; Flavell, 1979; McCrindle & Christensen, 1995; Nashon, Anderson, & Nielsen, 2005; Nelson, 1996; Paris & Winograd, 1990). Recently, interest in metacognition has greatly increased among researchers studying students' reflections in an online learning environment (Anderson, 2001; Barbour & Collins, 2003; Davis, 2003; Papaleontiou-Louca, 2003; Rimor & Kozminsky, 2001-2002). In addition, researchers in this field examined the role of the teacher's support in the online environment, and the strengths and weaknesses of this platform (Jonnasen, 2000; Lehman, 2006; Nehama, Kalay, & Rimor, 2005; Nir-Gal, Nur, Gelbart, & Reingold, 2005; Rimor, Reingold, & Kalay, 2006; Zemsky & Massy, 2004). The main goal of the current study was to investigate the relationship between students' metacognitive reflections and instructor's scaffolding in an online teacher education course. In addition, we explored the unique potential of the online environment in the context of teacher education and in facilitating students' acquisition of critical and reflective thinking skills.

Theoretical background

Recently, traditional teacher education programs have been the focus of much criticism both on general grounds due to their programmatic ineffectiveness (Russell, 2001), and more specifically, in light of the emergence of alternative constructivist pedagogical and social frameworks formats such as multiculturalism (Bennett, 2001; Jenks, Lee, & Kanpol,

2001), critical pedagogy (Keesing-Styles, 2003) and progressive social movements (Diniz-Pereira, 2005).

The main criticism leveled at traditional teacher education programs is that most programs fail to integrate the theoretical foundations of teaching and the reality of teaching and it remains up to individual students to struggle with this difficult task. Unfortunately, because programs are largely unsuccessful in relating theory to the pragmatics of teaching, new teachers who are frequently overwhelmed by the demands of everyday teaching tasks tend to overlook theoretical concepts. Furthermore, the socialization process that characterizes teacher education programs puts emphasis on the acquisition of techniques and skills and largely neglects educational and social goals. Consequently, teacher education students and new teachers often fail to develop a clear representation of the broad significance of teaching, the complexity of this profession and the enormity of the required knowledge.

The tremendous increase in the popularity of online courses in general, and the new E-learning pedagogy in particular constitute a major challenge to traditional conceptualizations of the teacher's role and teacher education (Chou 2003; Cowham, 2005; Dabbagh, 2003; Danchak & Huguet, 2004; Easton, 2003; Fitzpatrick, 2001; Rumble, 2001; Volery, 2001; Zemsky & Massy, 2004).

A fundamental goal shared by most alternative constructivist curricula is the desire to produce professional and broad-minded teachers with an educational and social awareness (Combleth, 1986; Hartnet & Naish, 1980; Wilson, 1989). To accomplish this goal, these curricula emphasize the importance of an environment in which prospective teachers would develop critical thinking and critical self judgment by experiencing learning through reflective and metacognitive processes (Davis, 2003; Dawason & Bondy, 2003; McCrindle & Christensen, 1995; Shulman & Shulman, 2004). Metacognition is defined as the knowledge and awareness of one's own cognitive, emotional, and motivational processes, and the ability to actively control and supervise them (Brown, 1987; Flavell, 1979). Empirical support for the value of this educational emphasis is derived from the finding that metacognition constitutes a fundamental predictor of academic achievement (Anderson, 2001).

There is a broad theoretical and empirical consensus that the influence of metacognition on the outcome of learning is strongly linked to the processes of reflection (Anderson, 2001; Buttler & Winne, 1995; Davis, 2003; Efklides, 2006; Ertmer & Newby, 1996; McCrindle & Christensen, 1995; Nashon, Anderson, & Nielsen, 2005). It is commonly assumed that reflection expresses an awareness of the learning processes and aids the learner in overseeing; assessing and improving his/her progress. For example, the constructivist theory of learning views reflection and discussion as a vital mechanism in the construction of knowledge. The process of reflection is thought to facilitate the organization of relevant previous experiences and prior knowledge and the articulation of the links between action and thought and between knowledge and the control of the learning processes. Consistent with this hypothesis, several studies demonstrated that encouraging reflection processes in students significantly improves learning success (Davis, 2003; McCrindle & Christensen, 1995; Nashon, et al., 2005; Rimor, 2002).

The main goal of the present study is to further extend the investigation of reflection processes during learning to the area of teacher education and to the online learning environment. It is clear that prospective teachers, like all teachers, should benefit from engaging in productive reflection about their teaching (Davis, 2003; McCrindle & Christensen, 1995; Nashon, et al., 2005; Nir-Gal et. al. 2005; Rimor, 2002). This contention is supported by preliminary research examining the nature of reflective thinking processes in

prospective teachers (Dawson, 2005; Schulz & Mandzuk, 2005). In the present study we focus on the importance of assessing instructor's scaffolding in an online course. The online format is often conceived as a forum for exchanging thoughts and feelings in the course of studies. Consequently this format may constitute a unique and valuable tool for documenting and examining the links between teaching, learning and the processes of reflection. The online format seems particularly suited for deriving metacognitive measures based on the easily obtainable and comprehensive protocol of learners' explicit written reflections. It appears that the online environment can serve as a constructivist learning environment characterized by self-regulated learning (Rimor & Kozminsky, 2001-2002).

The online learning environment has a unique potential to promote an in depth dialogue and a framework of openness to new knowledge and ideas (Thomas, 2002; Wolfe, 2001). The relative anonymity that characterizes the virtual nature of online distance education courses allows learners from diverse backgrounds to feel more confident and secure and to openly express their views and collaborate with others who might otherwise be reluctant to listen to their arguments (Chute & Shatzer, 1995; Kyong-Jee & Bonk, 2002). 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 (Berent & Bugbee, 1993). Vygotsky (1978) emphasizes the importance of teachers' support to the development and progress of students. As mentioned above, more recently, scholars argued that the online environment could be an optimal platform for teacher's support. Consequently, in the present study, we were particularly interested in studying the importance of online feedback provided by the instructor. Specifically, such feedback and guidance can function as a system of scaffolds that may promote the reflective and metacognitive learning processes (Efklides, 2006).

Reflective and metacognitive learning processes have a unique importance in the context of multicultural education. The designer and instructor of the course, which is analyzed in this study, was influenced by two multicultural education theories: The first was Wurzel's (1988) educational model of multicultural development, and the second was Banks' (1996) typology of knowledge levels. In Wurzel's terms the idea was to allow the students from the two cultural and national groups to move from ethnocentric perspectives to multicultural ones. According to Banks' terminology the mission was to shift the students from basing their ideas, values and beliefs upon popular knowledge (i.e., ethnocentric perspective) to a transformative one (i.e., more democratic and multicultural), through reflection upon reading of academic materials and through dialogue in a community of learners.

In order to promote reflective and metacognitive learning processes, and by that to enable changes in the students' perceptions, the instructor requested the students to write four reading journals concerning several assigned articles covering both basic concepts and controversial and provocative views related to the four topic of the course:
   A. Alternative Democratic Models.
   B. The Israeli Democracy─ characteristics and problems.
   C. Multiculturalism and Multicultural Education.
   D. Can the Israeli society become ideologically multicultural?
The journals were sent via e-mail and were followed by an online dialogue between the instructor and each of the students individually. In addition, students were asked to participate as a group in four online forums created especially for the course. Each of the four forums was devoted to a dilemma regarding one of the sub-topics of the course. These forums were active throughout the entire duration of the course.

Methodology

The present study analyzed the complete record of an online course on multiculturalism and democracy, which was taught as part of a teacher education program in a southern university in Israel. Sixty eight candidates for the course were selected from a group of teachers who work in Bedouin and Jewish schools in Israel. The candidates were experienced teachers who did not have a formal teaching certificate. The Bedouins and the Jews participated in two parallel but separate accreditation programs. The specific course on democracy and multiculturalism constituted the only framework in their studies in which these two groups of teachers could study together. The course design employed an asynchronous online forum format. This learning environment facilitated a direct dialogue between the two groups concerning sensitive and vulnerable issues such as democracy and inter-cultural conflicts in the Israeli society.

As discussed above, the main aim of the current research was to study the relationship between the instructor's feedback and students' metacognitive processes. To accomplish this aim we set two operative goals. The first goal was to examine and determine the nature of metacognitive process expressed by the students in the online forums. Students' responses were content analyzed employing the Meta Cognitive tool for Students' Reflections (MCSR), which was developed for analyzing metacognitive indices in online forums. The MCSR tool is based on Flavell's (1979) model, and analyzes the students' reflections according to three metacoginitive dimensions: 1) personal, 2) task, and 3) strategy.

The text of the forum protocol was analyzed along the three-metacognitive dimensions. Each dimension was initially defined via operational indices. These indices represent the types of reflections found in the participants' discourse. The protocol of the forum's discussion (the text) was divided into paragraphs, which constituted the units of analysis. Paragraphs were delineated based on the topic of discourse, with a change in topic marking the boundary between paragraphs. For each unit of analysis statements were initially classified as reflective or non-reflective. Reflective statements were linked to individual participants and further classified by using the MCSR tool. Inter-rater reliability was satisfactory (Kappa=0.84) (Rimor, 2002; Rimor & Kozminsky, 2001-2002). The MCSR tool was further refined based on the current study by adding 4 parameters to the metacognitive affective dimension. Thus, in the analyses reported below, students' statements in the forum were coded in accordance with 22 parameters of the tool. (See table 1).

The second goal of the current study was to analyze messages posted by the instructor in the forum, which was designed to provide students with support and feedback throughout the duration of the course. A new tool was developed for this purpose: Tool for analyzing Instructor's Online Scaffolding (TIOS). This tool enabled us to analyze the different types of Scaffolds provided by the instructor during the online course. Using this tool we were able to identify four types of online scaffolding provided by the instructor: 1) technical, 2) content-centered, 3) procedural, and 4) metacoginitive.

These two research tools (MCSR and TIOS) were combined to examine the relationship between scaffolds provided by the instructor and the manifestation of metacognitive processes, as expressed by students in the online forums.

The development of the MCSR and TIOS was guided by the paradigm of Activity Research (Nardi, 1996). The categories of these tools were defined and shaped according to the contents of the discussion, the purpose of the forum, and the characteristics of the course. We employed the grounded theory approach, which argues that analytic categories used for conceptualizing the data should emerge from the participants' answers, rather than being imposed by the researcher. Accordingly, emergent categories together with their properties became the basis for interpreting the findings (Russo & Ford, 2006).

One thousand forty eight written messages were produced in the four forums. Postings by students were discarded from the analyses if they were determined not to be related to the metacognitive indices of the Meta Cognitive tool for Students' Reflections (MCSR). This produced a total of 700 forum postings by the students. In addition, 66 forum postings written by the instructor were analyzed, using TIOS, which was developed for the present research.

Results

An analysis of the 700 postings by students was performed according to the three dimensions the Metacognitive tool: Personal, Task, and Strategy. Table 1 summarizes the distribution of the metacognitive dimensions that emerged from the students' protocols.

Table 1

An analysis of students' reflections in the online forums: Frequencies of metacognitive indices (percentages)

A. Personal Indices	Description	%
3. Emotions Total **(PA)**	Expressions of emotion in regard to searching for data and/or regarding the process of communication on the net	28 (N= 280)
Expressions of affection **Pa1**	Expressions of affection, consent, satisfaction	13 (N=125)
Expressions of objection **Pa2**	Expressions of objection, anger, dissatisfaction	9 (N=95)
Expressions of communality **Pa3**	Expressions of communality, enjoying forum co-dependency	4 (N=41)
Expressions of frustration **Pa4**	Expressions of frustration, hesitation, fear, despair, sense of getting lost	2 (N= 19)
5. Request for response **(PA')**	Relates to time of response, request for response, request for patience	5 (N= 51)
6. Relating to the presence of the other **(PI)**	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)**

B. Task Indices	Description	%
3. Relevancy **(TR)**	Assessment of the relevance of the data found, in relation to the user's aim	2 (N= 18)
4. Problems and difficulties **(TP)**	Description of problems and difficulties in the course of carrying out the task	1 (N=7)
6. Contents **(TC)**	The individual's insights on the contents the data, new ideas, prior knowledge	42 (N= 416)

7. Characteristics of the net environment **(TS)**	Relation to the structure and functions of the internet (the infrastructure of web sites, search engines, links, asynchronous communication).	1 (N=18)
Total Task Indices		**46 (N=459)**

C. Strategy Indices	**Description**	**%**
5. Explanation **(SA)**	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 **(SG)**	Expressing a personal opinion or conclusion regarding a task, strategy and work on the net in general	1 (N=11)
9. Referral **(SH3)**	Referring to sites and resources providing help without requests	4 (N=36)
Total Strategy Indices		**6 (N=56)**

no data was found for several categories: A. Personal Indices: Personal Traits (PT), Cognitive styles (PS), Achievements (PP), B. Task Indices: Characteristics of data sources (TD), Availability of data sources (TZ), Feasibility of performance (TF), C. Strategy Indices: Planning (SN), Choosing and implementing a strategy (SS), Assessment of results (SE), Monitoring and revisions (SM), Requesting help (SH1), Helping (SH2)

As shown in Table 1 the Personal metacognitive dimension constituted about half of the students' reflections in the forum (48%). Students expressed personal insights about themselves as learners on line and emotions concerning their search for data and/or regarding the process of communication on the net. Further analysis revealed that the most salient reflections were related to the content of the task (42%) and emotionally with the online learning environment and the forum community itself (28 %). It included both positive (17%) and negative emotional expressions (11%). Below are a few illustrations of actual postings that were classified as related to the Personal Task or Strategy dimensions:

A) *Personal*
1. My first reaction towards your comment was a feeling of anger and frustration. I felt that you didn't understand the question and that you expressed anger and frustration, instead of answering the question (PA2, PA4).
2. I was very satisfied when I read your warm and personal comment (PA1).
3. It is very nice to read such comments. Mutual respect is an important basis for good relationship in a pluralistic society (PA1, PA3).

B) *Task*
1. The article *Alternative Democratic Models* reveals different Democratic models. It is very hard to choose which model is the best and to explain my decision (TC).
2. The discussion about the last two articles could demonstrate very well the gap between the academic ivory tower and daily life (TR/SE).

C) *Strategy*
1. Your last comment summarized for me all the articles I read about democracy (SG).
2. My journals…. I sent them on time but maybe not in the right way (SH1).

3. This analysis of students' reflections portrays the forum as a learning environment, which is oriented towards the task and the person. Table 2 introduces the distribution of various types of scaffolds, which were delivered by the instructor to the students in the forum.

Table 2
Distribution of instructor's types of scaffolds in the forums (percentage).

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% (N=66)

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

Spearman's correlation between instructor's scaffolding and students' metacognitive scores demonstrated a highly significant correlation between them. The instructor's

scaffolding score was highly correlated with the student's metacoginitive score (r=0.497, p< .05). Average scores were computed for each metacognitive dimension and for each type of instructor scaffolding(Personal: M = 7.33, Sd = 8.14 Task: M = 6.96, s = 4.38 Strategy: M = 0.96, s = 1.88), and for each type of instructor's scaffolding: (Technical: M = 0.09 , s = 0.29 Content: M = 0.19 , s = 0.40 Procedural: M = 3.24 , s = 0.46 Metacognitive: M = 5.34, s = 0.81).

Below are several illustrations of the instructor's scaffoldings:

A. Technical support: I haven't got your paper otherwise I would have responded. Please send me your paper using another e-mail address.

B. Content support: I recommend that you read the article by Banks, which deals with multicultural democracy, and Taylor's book named: *Politics of Recognition.*

C. Procedural support: Finally a comment based on assigned articles. Your previous postings were interesting and scholarly, but this is the first one which is related to the theoretical framework of the course.

D. Metacognitive support:
   1. You are right, there are several democratic models, and this is the topic of this course. But, which model do you prefer?
   2. You are right Israel is a Jewish state. It is also true that absolute equality is only a Utopia, but doesn't it disturb you that Israel defines itself as a democracy although it discriminates against its Arabic citizens so severely?"

Table 3

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

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

*p< .01 ** p<.05

As shown in Table 3, further 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. This analysis indicates that the Task dimension of the students' metacognitive thinking was consistently and significantly correlated with all types of instructor's scaffolding (metacoginitive: r= .29, p<.05; content support: r= .35, p<.01; procedural support : r= .31, p<.01; and technical : 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 course. An appropriate instructor response can turn the course into a learning environment in which students would experience learning through reflective and metacognitive processes. As mentioned earlier, the importance of these processes to learning has been considered and suggested in many prior studies. Our study extends these prior investigations by providing strong empirical evidence to support the relationship between instructor's scaffolding and students' reflective and metacognitive processes.

Specifically, the metacognitive scaffolds provided by the instructor included the presentation of the rationale for the task, fostering the integration across various course readings and course objectives, supporting reflective writing, differentiating between conclusion, fact, opinion and hypothesis, supervising text comprehension, focusing on the process of learning and encouraging interactions among the participants. These metacognitive-scaffolds were all found to increase the extent to which students tended to reflect on their task and consequently contributed to their experience as a community of learners with a common task.

The current study may have some important implications for the discipline of teacher education. Online course coupled with instructor's scaffolding has a unique potential to promote students' metacognitive reflections. Based on our findings we recommend including online courses coupled with instructor's scaffolding in teacher education programs. We also urge teacher education policy makers to adopt the online environment for multicultural education courses. We hope that new teachers who experience reflective learning process during their teacher education studies will have the skills and the awareness to promote such learning process in their own classes. Adding such courses to teacher education programs might produce a constructivist reform in teacher education and new teachers would become agents of social change.

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