Effects of Using Online Forum for Problem-Solving Skills and Collaborative Construction of Knowledge in Student Teaching

Jackie HeeYoung Kim
11935 Abercorn ST, Savannah, GA 31406 USA
Armstrong Atlantic State University
Jackie.kim@armstrong.edu
Tel: 912-398-7640

Abstract
The purpose of the study was to seek a way to strengthen student teachers' understanding of the complex nature of teaching and increase their competence in solving problems. To accomplish our goal, we embarked upon a study to explore on a computer-mediated conferencing group model enriched with constructivist principles and features of a community of learners. The study is guided by two major models: Problem Solving Approach Model and Interaction Analysis Model (IAM) for Computer-Mediated Communication rooted in social constructivist theory. This study also is aimed at assessing the quality of interaction by means of IAM for examining social construction of knowledge, and of learning experiences of student teachers during computer conferencing while learning problem-solving skills. Implications and suggestions for teacher educators will be offered.

Keywords: Computer-Mediated Communication, student teaching, problem solving approach, interaction analysis model, constructivist principle

1. Introduction

Difficulties associated with student teaching relate to time and scheduling constraints, which limit opportunities for student teachers to communicate reactions, reflections, and questions raised after entering into their internship. This has resulted in the lack of opportunity for student teachers to process and make sense of their experiences at field sites by applying and connecting concepts from coursework and by sharing their questions and reflections with peers. The interchange of questions and reflections about learners, pedagogy, and teachers' instructional and classroom management behavior, between and among student teachers, is essential for making sense of the complexity of the social macrocosm of classrooms and schools. Thus, specific ways to foster such interchange among student teachers should be explored and described.

2. The purpose of this study

Our purpose of the study was to seek a way to strengthen student teachers' understanding of the complex nature of teaching and increase their competence in solving problems. To accomplish our goal, we embarked upon a study to explore on a computer-mediated conferencing group model enriched with

constructivist principles and features of a community of learners. Two major models guide the study: Problem Solving Approach Model (Bransford & Stein, 1993) and Interaction Analysis Model for Computer-Mediated Communication rooted in social constructivist theory (Gunawardena, Lowe, & Anderson, 1997).

This study also is aimed at assessing the quality of interaction and of learning experiences of student teachers during computer conferencing while learning problem-solving skills. To examine the quality of interaction, this study examined student teachers' discussion contents by using the Interaction Analysis Model (IAM). The IAM analyzes the online discussion by using five phases: 1) sharing and comparing information; 2) the discovery and exploration of dissonance or inconsistency or advanced teaching strategies; 3) negotiation of meaning/co-construction of knowledge; 4) testing and modification of proposed strategies or co-construction; 5) metacognitive statements/applications of newly constructed meaning. This study offers implications on whether use of computer-conferencing in student teaching is effective enough to increase student teachers' problem- solving skills and knowledge construction as well as to prove the fact that computer conferencing is an instrumental medium for quality discussion among student teachers. This paper is the first stage of research that investigates the nature of the dialogic processes generated among student teachers in an online discussion group. This study is guided by the following research questions:

- How do student teachers perceive the disadvantages and the advantages of using online discussion for engaging in collaborative problem solving?
- Is there evidence of collaborative construction of knowledge in the online forums among student teachers?
- Does computer conferencing serve as an instrumental tool to foster quality discussion among student teachers?

3. Theoretical Framework

3.1 Problem-Solving Approach

Gagne (1980) said, "The central point of education is to teach people to think, to use their rational powers, to become better problem solvers." Since learning to teach is far from a simple process, and is predominantly associated with ill-structured problems, teacher educators need to seek a way to help student teachers build the ability to locate, understand, and respond to the dense and multi-faceted problems of the classroom. As an effort to build student teachers' problem-solving and reflection skills, this study adapted the problem-solving approach, particularly the IDEAL approach, advocated by Bransford and Stein (1993). The IDEAL approach was used to help student teachers frame the way of approaching problems in the classroom. The IDEAL approach includes: 1) **I**dentify problems and opportunities; 2) **D**efine goals; 3) **E**xplore possible strategies; 4) **A**nticipate outcomes and act; 5) **L**ook back and learn. The student teachers will locate their problematic cases and look for the strategies consistent with their goals both in literature and with professional assistance from professors and cooperating teachers.

3.2 Asynchronous Online Interaction

One way to promote this collaborative problem-solving approach is to use online forums. Online discussion is considered to be a learning environment in which students can achieve higher conceptual knowledge through interaction of knowledge and experience among all students (Harasim, 1993). A student-to-student communication scheme of online discussions—synchronous or asynchronous—provides the major tool to develop a learning community (Choi, 1999; Park & Kim, 2000). Markel (2001) asserted that the advantage of online discussion lies in allowing students time for reflection.

3.3 Social Construction of Knowledge and the Interaction Analysis Model

This study is based on Pea (1993)'s argument that knowledge is commonly socially constructed, through collaborative efforts toward shared objectives or by dialogues and challenges brought about by differences in a person's perspective (p. 48). Like Smith (1994), who argued that Vygotsky's (1978) distinction between lower and higher mental functions can be applied to a group's collaborative skills, we observed that as the group interacted together more effectively and learned from each other, the successive stages they went through could be considered forms of higher mental functions. The Interaction Analysis Model, therefore, begins with what could be described as lower mental functions (the sharing and comparing of information) and moves through cognitive dissonance, to higher mental functions.

4. Methods

The major data sources for this study were online discussion posting transcripts, descriptive survey data about the effectiveness of online forums during student teaching, and interview data about the advantages and disadvantages of participating in online forums during student teaching.

4. 1 Context

The subjects of this study are four undergraduate and graduate students who were enrolled in Internship II (Student Teaching) for their initial certification in the Early Childhood Education and Special Education major in the College of Education at a public university on East Coast. To extend and build student teachers' problem solving and reflection skills through socially constructed interaction, student teachers were given access to and invited to participate in Web-based discussion through an online classroom management system called VISTA. The VISTA discussion board was a space for student teachers to share the problems, solutions, and implementations of their practice during internship. The university supervisor posted the weekly discussion topics based on the steps of the IDEAL approach advocated by Bransford and Stein(1993), each week, student teachers were required to comment on peer student teachers' postings and responded to other comments.

4.2 Data Analysis

A modified version of typological analysis outlined by Hatch (2002) guided out analysis. In typological analysis (i.e., deductive analysis), the researcher separates the data into categories based on pre-determined constructs. " Typologies are those created by the researcher that are grounded in the data but not necessarily used explicitly by the participants. As with all analysis, this process entails uncovering patterns, themes, and categories" (Marshall & Rossman, 2011; p. 215). Such frames can emerge from theory, experience, or research; these frames then become the basis for dividing and grouping data (Hatch, 2002). In this study, the categories for typological analysis represent the five phases of interaction outlined by Gunawardena, Lowe, and Anderson (1997). We copied and pasted all of the student teachers' online postings into Word processing documents for analysis. Once these were created, we independently read through the postings, and coded the concepts by phases.

5. Findings

While analyzing the data set of this study, two questions were raised in our minds: Did the computer conferencing during internship move through the phases of social construction of knowledge? Can we say that social construction of knowledge occurred with the five topics of the IDEAL approach? In a nutshell, we found that actually these five steps of the IDEAL approach promoted and were closely interrelated to five phases of Interaction Analysis Model. Instead of giving non-structured and open discussion topics for

reflection about teaching practice, the steps of the IDEAL approach served as a framework to organize student teachers' thoughts, and to analyze and understand the problems. The key benefit of using the IDEAL steps was to increase the frequency of higher mental operations in the discussion transcripts. While participants defined goals, explored strategies for the problem, and looked back, they engendered higher mental operation such as testing against cognitive schemes and metacognitive statements. We found the coincidental fact that the five steps of the IDEAL approach engaged student teachers in generating mental operations that were well-aligned with five phases of Social Construction of Knowledge.

5. 1 The Advantages of Using Online Discussion

According to data collected in this study, online forum promotes the multi-faceted approach to interaction and reflection. Online forum affords a space through providing emotional, pedagogical, and psychological support for student teachers (Paulus & Scherff, 2008). As Pea (1993) remarked that knowledge is commonly socially constructed, through collaborative efforts toward shared objectives or by dialogues and challenges brought about by differences in a person's perspectives (p. 48). We found social nature of knowledge construction through CMC increased the opportunity for student teachers to process and make sense of their experiences at field sites. The study results showed that student teachers became better practitioners in applying and connecting concepts from coursework and in sharing their questions and reflections with peers though CMC. In addition to the positive effect on their pedagogical improvement in teaching through CMC collaborative discussion, it seemed that student teachers, supported each other emotionally in practice through exchanging and discovering that they faced similar situations.

5.1.1 Interaction Opportunities with Other Student Teachers

The interview and descriptive survey results showed the positive responses of all student teachers toward use of online forums during student teaching. One of the significant findings was that student teachers appreciated interaction opportunities with peer students. Opportunity to communicate with other student teachers was not in place in their internship program as a curriculum. In addition, student teachers were often scattered and isolated from peer student teachers even in the same building. As a result, the internship experiences were limited to interaction between the intern and the cooperating teacher in the classroom.

- Even though we are in the same building, we hardly see each other. Even if we can converse in the hallway, there is no way that we can have a deep conversation (Meghan).
- Being able to talk to other interns was helpful (Sylvia)
- It is a great tool to begin conversations and to get others' opinions. I received many great suggestions through collaborative problem solving online (Amanda).
- It works better with multiple schedules where people do not have to meet together at a specific time. (Elyana)."

5.1.2 Interaction with People at the Same Level

They valued the interaction with people at the same level as them, non-hierarchical interactions absent in interaction with cooperating teachers or university supervisors. It seemed conversing with other student teachers created their comfort zone where there was no tension, which was inevitably generated by the evaluation authority of the cooperating teacher or university supervisor.

- I enjoyed talking to people who are in the same shoes (Sylvia).
- It was good to know I am not only one who was struggling (Meagan).
- It was easy to complain to peers about the class (Elyana).

5.1.3 Appreciation of Different Perspectives on the Same Issue

They enjoyed getting different perspectives on the same issue and seeing how their peers dealt with the same problem. The peers' different perspective gave student teachers a new way of looking at a solution.

- I have gained a new way of looking at a solution I would not have thought about (Meghan).
- I have learned the perspectives of other interns. It gives me an insight into what others in my position are experiencing and how they have dealt with similar issues. (Amanda).
- We all listed the same problem, but all had different solutions. Of course, we all had different grade levels. (Elyana)."

5.1.4 Perceiving Peers as Valuable Resources

The collaborative discussion created a new scheme: that peers can be a valuable resource from whom they could learn. This phenomenon was closely related to Vygotsky (1978)'s proposition of social constructivism.

- I am able to try something that another student teacher has already used and found successful. Or I may not do something that an intern has done and found to be unsuccessful (Sylvia).
- I learned that peers could be wonderful resources (Amanda).
- I enjoyed talking about what works and what does not and how to handle it. (Meghan).
- We can learn from each other. (Meagan)
- My cooperating teacher was very resourceful so I had so many resources, but Amanda did not have many. We talked and shared resources. (Elyana).

5.1.5 Relief Catalyst

The collaborative discussion in CMC further created emotional support. Student teachers often felt vulnerable in their new role. Worries over their execution in the classroom generated the tension and stress during the internship period. The evolving stress was released to a great extent after they gained knowledge that other interns faced similar issues in their class. It was a pleasant relief for student teachers to discover that others faced either the same or very similar issues.

- I felt better after reading others' postings. I was not the only one to have a problem. We all listed the same problem. (Meghan).
- I have learned that I am not the only student teacher that faces the problems that I face. We share ideas, information, and feedback. (Elyana).
- My problem was their problem. (Amanda)

5.1.6 Reflection Time Opportunity and Framing the Paths to Solutions

Smith (1994) noted that Vygotsky and his followers include several key concepts that are useful for understanding collaboration in a group. These include "situated activity, mediating device, and higher and lower mental functions. Smith observed that the computer-mediated communication itself may be a very strong "mediating device" (i.e. computer-mediating cognition). And the ideas voiced by other participants influence one's own thinking, another form of mediation (i.e., group-mediated cognition).

Another significant advantage to interacting with peers in online forums was that this design of online forum allowed student teachers to step back and reflect on the problem. They then could consider their goal for this issue and broke down the problem-solving approach into steps. One of the most significant findings was the fact that they learned to approach a problem in a more systematic way. They learned to go through the steps necessary to solve their problem. When asked the question: " If you have a problem in your classroom, what is your main approach to solve the problem?," all student teachers' comments were related

to the IDEAL approach. Since this design of the online forum emphasized research-based solutions, the pursuit of research-based solutions repeatedly emerged in the interview and survey data.

- My main approach would be to go through the IDEAL approach. Every step is needed to solve a problem (Sylvia.)
- We wrote something that we would not say face-to-face (Meagan).
- The IDEAL approach allowed me to evaluate myself and evaluate research-based strategies. Those are things I might skip without knowing the five steps of IDEAL approach (Cheryl).
- The IDEAL approach made me think about the problem slowly. (Sylvia.)
- I learned to approach a problem in a more systematic way (Amanda).
- The IDEAL approach taught me to go through steps to fix the problem. It seemed very accurate about how to solve problem since it breaks down the problem. (Elyana).
- The IDEAL approach gave me a systematic view of an approach to the issue. We have to have an outline to solve a problem. I need to step-back and think about what is the problem and what is my goal. (Meagan)

5.2 Collaborative Construction of Knowledge in Online Forums during Student Teaching

Online learning communities are a collaborative means of achieving shared creation and shared understanding in which a mutual exchange of community members is encouraged to support individual and collective learning (Ludwig-Hardman & Woolley, 2000). In this article, we showcased the examples of interaction analysis for examining social construction of knowledge. Analysis of the discussion transcripts indicated that the majority of postings occurred at Phase I, Phase II, Phase IV, and Phase V. It was evident that computer conferencing during internship moved through the higher phases of social construction of knowledge, indicating fairly high quality, as several participants were involved in exploration of dissonance or the negotiation of meaning and co-construction of knowledge (see Table 1).

In analyzing the process of the entire discussion through the phases, it was evident that Vygotstky (1978)'s distinction between lower and higher mental function can be applied to a group's collaborative skills. We observed the group interacting together more effectively and learning from each other. The content of discussion moved toward forms of higher mental function.

It is critical to note that Guawardena, Lowe and Anderson (1997) hardly saw evidence that the discussion proceeded beyond the first three stages of social construction of knowledge. They came to realize that the online forum was a useful sharing of professional experience. However, informal professional discussion is not congruent with the action in construction of new knowledge. Guawardena, Lowe and Anderson (1997) felt that it was difficult to arrive at an adequate judgment of the quality of an online learning experience by the application of a single method. They considered having better moderators who could lead the debate skillfully.

However, this study found higher mental functions of social construction of knowledge appeared throughout the postings in analyzing the progress of the entire discussion transcript. This study showed that the structure of the discussion contributed to leading to the higher mental function in the collaborative discussion. The discussion format of this study guided students to follow the systematic steps to approach the problems: the IDEAL approach. Coincidently, there is an overlap between elements of the IAM model and those of the IDEAL approach. The inquiry items of the IDEAL approach directly required student teachers to discuss the IAM operation items. The IDEAL approach topics did not stay passive until some relevant operations or cognitive process emerged from the discussion process. Instead, the IDEAL approach directly asked higher-level cognitive operation questions. As the IAM seeks individual components of the

cognitive process, the IDEAL approach uses an algorithm method where student teachers find a step-by-step solution to a problem. Both approaches have a common ground in breaking down the whole.

The following figure compared the percentage of incidents in each of the phases of the model between the analysis of the IAM conducted by Terry Anderson (Gunawardena, Lowe & Anderson, 1997) and that of the IAM investigated by this study. The lower rating Phase III (Negotiation of Meaning/Co-construction of Knowledge) showed the lack of student teachers' negotiating skills in establishing meaning of their practice (see Table 2).

The highest contributions that occurred in CMC discussion were coded as Phase I: Sharing/ Comparing of Information. Most of discussion for the first stage of the IDEAL approach (Identify Problem) coded as Phase I. For instance:

> I am having a hard time with differentiation in my classroom. I find it extremely difficult to challenge all students in the class that are on different levels. I am in a kindergarten class, and there are children on the low level that do not even know their letters let alone the sounds. On the other hand, there are children who are already reading on a first-grade level. How do you challenge all of the children on different levels and still expose them to the ideas and materials? I have some students that I have spent some time with one-on-one and they do well. How do you help all 21 students when you are just one person?
>
> I am having difficulties with some students' misbehaviors. I am in a kindergarten classroom where many disabilities and disorders have not yet been diagnosed and, as a result, the classroom environment suffers. One child in particular will scream during lessons, fight with other children and is a large distraction. We are constantly watching her, talking to her and occupied with her, and I feel that it really takes away from the rest of the class. Behavior management is a problem because the "behavior plan" that is in place works well for most students but not for the students who really need it. I always feel bad that the students who are behaving do not receive as much as attention as the children who do not behave. How can I find a way to keep these students' behavior in control so that it is not negatively affecting the other students?

The above message, which is coded as Phase I, exemplified three types of operations in this Phase: 1) location of concerns and difficulties, 2) analysis of the situation, 3) inquiry of the improvement plan. When asked to identify a problem, student teachers analyzed elements of the problem they faced and delineated the entire picture of the problem, and searched for ways to reach the desired state. Likewise, the discussion transcripts of the "Define Goals" topic were mostly coded as Phase I, especially Phase I/ E (Definition, description, or identification of a problem):

> My problem that I identified was the ability to reach all of my students no matter what level they are at. My classroom is extremely differentiated so my goal is that I can teach children in a way that makes sense to them and helps them learn. I have quite a few ESL students and they are extremely capable but the language barrier does create obstacles. I also have many students that excel and are very smart. My goal is that no student ever feels bored or overwhelmed. Differentiation is something that can seem daunting but it is necessary in all classrooms.
>
> My goal is to reduce the number of students who call out answers. I also want to reduce the number of student who get up out of their seat at any given time during class. I need to reinforce classroom rules and procedures. I understand that my goals need to be specific and measurable. Even though my cooperating teacher already has a behavior plan and reward system in place I have spoken to her and made the following suggestions; Students who stay in their seat and raise their hand before

> speaking can earn points per class. This would only work if the students stay in their seat without reminders. Now that we have discussed it, next thing we'll do is to think about how we could organize and keep track of it. One idea I have is that we will ask them to set their behavior goal for the week. We are still thinking about the specifics of it, but by the end of this week will have it all planned out and ready to be put into action. I'd like for students to start setting their own behavior goals. If students learn to set their own goals, maybe it will help them make better choices.

The discussion content of "Define Goals" also largely coded as Phase II (Especially Phase II/A: identifying and stating areas of disagreement). When student teachers defined goals to solve the problem, they found the areas in which their cooperating teachers established a negative learning environment in the classroom. For instance:

> It is difficult enough to maintain control of the classroom when it is your own classroom. However, I am in a classroom with a SPED teacher and a general education teacher. Neither of them seem to have control at all times. Students are constantly getting out of their seats to sharpen pencils, ask to go to the bathroom, or just change seats because they feel like it. How do I command respect when I am teaching the class, when I am a guest in someone else's class? I don't see that any set standards for behavior were set at the beginning of the year. In addition, this is a mixed class with SPED, general education and gifted students. Yet I tend to have more behavior issues with the gifted students. My goals are to determine how to collaborate with the other two classroom teachers to manage the discipline problems in the room. My other goal is to come up with some ways to motivate the students to want to behave better.

The discussion content of "Explore Possible Strategies" also largely coded as Phase II, especially Phase II /C (Restating the participants' position referring to literature) in students' effort to find the instructionally possible strategies in literature. This topic of discussion required locating the strategies to employ in an effort to solve the problem in their practice. After placing the chosen strategies in their teaching agenda, students restated their positions in basis of the literature propositions:

> I am concerned with finding a solution to deal with classroom management. According to Long and Frye (1985), it is a myth to believe that "effective teachers can prevent all discipline problems by keeping student interested in learning through the use of exciting classroom materials and activities." They go on further to say the problems exist beyond academics, such as problems at home, interactions with peers in the hall or lunchroom, or even mood swings for no apparent reason. I see a lot of this at my school. Students do not come to school prepared to learn. Many of them come without a book bag, pencils, or paper. They come to school eating potato chips for breakfast. They come to school with an attitude of indifference.
>
> According to the National Comprehensive Center for Teacher Quality study on effective classroom management, teachers should be sure to monitor that students are engaged in learning, implement classroom rules and routine, enact procedures that encourage positive behavior, use behavior-reduction strategies. And collect and use data to monitor student behavior. All of these things are strategies that we know of. However, carrying them out is the difficult part. I can be clear and concise with setting my rules and enforcing them, but I cannot control whether or not my co-teacher does the same thing. Consistency is important with children. It would be easier if there were one set of school-wide rules that were consistently followed. It is not that the rules do not exist, they are just not consistently enforced.

The nature of the discussion topic of "Anticipate and Act" generated many Phase IV (C: Testing against personal experience; B: Testing against existing cognitive schema) in the operation:

> My problem is being able to differentiate to every students in the class and still meet all of the different academic levels. Using some of strategies I found and suggestions from others, I tried some them today in class….. another strategy I used was one that my teacher suggested to me… I still feel a little weak in this area and still need to keep practicing.
>
> After much deliberation and discussion, my classroom teacher and I found the perfect way to tackle the behavior and "musical chairs" problem in our class. We have a behavior chart up now with every student's name on it…we have students create goals each week…Students are now more inclined to stay seated. I always heard and read about a reward system, but personally going through what I have been going through and establishing my own system really does helps me realize how the slightest management details can affect the overall classroom environment tremendously!

The last step of the IDEAL approach spawned Phase V operations, which involve metacognitive statements by participants. This was a natural consequence that "Look Back and Learn" topic was implicated in the metacognitive operation process. While the student teachers reflected upon their implementation of the newly learned strategies, they summarized the effectiveness of suggestions of the literature, the cooperating teacher or other participating student teachers. The reflective nature of the last topic afforded the space where a student teacher engaged in the metacognitive operation. Phase V operations were also found in the stage of "Anticipate and Act" where student teachers applied their new knowledge gained through interacting literature, the participating members, and the cooperating teachers.

6. Conclusion

6.1 Framing and Problem

We believed that the algorithmic, collaborative discussion through CMC helped student teachers equipped with a frame of how to grapple with the problem. Frames impact how we see and make sense of our lives; frame helps us to establish boundaries, name problems, form opinions, and uncover solutions (Entman, 1993; Goffman, 1974; Judge, 1992). Schön explains how teachers frame challenging situations that emerge in their practice through "naming the problem, setting boundaries of attention to it, and imposing coherence to provide directions for change" (cited in Achinstein & Barret, 2004; p. 719). Framed within a context of shared knowledge with discussion participants, each student teacher learned from other practitioners to solve problem by experimenting and working toward a viable solution in their classroom. Frames can assist student teachers in assessing their mental archives for similar experiences and can help them adjust their practice accordingly (Schön, 1987).

It is difficult to help individuals learn the ways of thinking and acting required by a profession. Learning to teach for this kind of practice is far from formulaic (Darling-Hammond, 2006; p. 40). It is up to teacher education to provide teachers in training with coursework and experiences to build on, challenge, and move beyond their perspectives and interpretations in order to see teaching with a wider lens (Kennedy, 1999; Wideem, Mayer-Smith, & Moon, 1998). We believed that incorporating CMC in student teaching with theory-grounded structure, such as the IDEAL approach, puts forward the needed training, which allowed student teacher to learn ways of thinking and acting requisite to the teaching profession. Through collaborative discussion practice, student teachers seemed to expand their ability to locate, understand, and respond to the dense and multi-faceted problems of the classroom. Markel (2001) asserted that the advantage of online discussion lies in allowing students time for reflection. Student teachers commented on positive effects of stepping back and breaking down the problems following the steps of the IDEAL approach, a process which was absent in their reflection process in the past experience.

Another key effect of CMC in student teaching was to build a community of learners. A student-to-student communication scheme of online discussions—synchronous or asynchronous—played the major role as a tool to develop a learning community (Choi, 1999; Park & Kim, 2000). Participants of CMC discerned the value of collaborative online forums from which they received pedagogical, managerial, and emotional support. Participants ascertained viable, experimental teaching ideas from other participants and new classroom management approaches. Additionally, they were relieved from the stress encountering a new role in their life by sharing and seeing in practice similar or the identical issues experienced by others. They gained some consolation by seeing that their peers were not always successful.

This study proved that computer conferencing is an instrumental medium for quality discussion among student teachers. This study also suggested that teacher educators should consider using online forums as a training to help student teachers build on, challenge, and expand their perspectives and interpretations in order to improve problem-solving skills. Further, it demonstrated criticality of building a systematic design of the online forum in an effort to increase the higher mental function of online communication. In the process of the analysis of transcripts, we learned that there has been an absence of student-student interaction in student teaching, which could develop a different communication environment from interaction with cooperating teachers and university supervisors.

The study of Amdiraal, Lcokhorst, Wubbels, Korthagen and Veen (1998) found that while CMC provided emotional support, it was not as effective for fostering reflection. In contrast, this study found that a well-structured forum grounded in properly aligned theory could induce quality reflection. The significance of this study is the development of a systematic online forum that builds social construction of knowledge and promotes problem-solving skills for student teachers. The chief advantages of the online problem-solving forum model are:

1. Its appropriateness for using constructivist, collaborative student teaching learning contexts
2. Its focus on research-based problem-solving skills
3. Its integration between the IDEAL approach and Interaction Analysis Model to check the quality of online forums
4. Its straightforward and simplicity of use
5. Its adaptation of Computer-Mediated Communication in student teaching

7. References

Achinstein, B., & Barret, A. (2004). (Re)framing classroom contexts: how new teachers and mentors view diverse learners and challenges of practice? *Teachers College Record, 106*(4), 716-746.

Admirall, W. F., Lockhorst, D., Wubbels, T., Korthagen, A.J., & Veen, W. (1998). Computer-mediated communication environments in teacher education: computer conferencing and the supervision of student teachers. *Learning Environment Research, 1*(1), 59-74.

Branford, J. D., & Stein, B. S. (1993). *The IDEAL problem solver: A guide for improving thinking, learning, and creativity* (2nd ed.). New York, NY: Freeman.

Choi, J. (1999). Exploration on educational strategies for enhancing interaction in Web-based learning. Korean Journal of Educational Technology, 15(3), 129-154.

Darling-Hammond, L. (2006). *Powerful teacher education: Lessons from exemplary programs.* San-Francisco:Jossey-Bass.

Entman, R.M. (1993). Framing: toward a clarification of a fractured paradigm. *The Journal of Communication, 43*(4). 51-58.

Gagne, R. M. (1980). *The conditions of learning* (3rd edition) New York, NY: Hot Rinehard and Winston.

Goffman, E. (1974). *Frame analysis.* New York: Free Press.

Gunawardena, C. N., Lowe, C. A., & Anderson, T. (1997). Analysis of global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of Educational Computing Research*, 17(4), 397-431.

Harasim, L. (1993). *Global Networks: Computers and Communication*. Cambridge, MA: MIT Press.

Hatch, J. A. (2002). *Doing qualitative research in education settings*, Albany, NY: SUNY Press.

Judsge, A. (1992). *Using disagreements for superordinate frame configuration*. Retrieved from http://www.laetusinpraesens.org/docs/fram.php.

Kennedy, M.M. (1999). The role of preservice teacher education. In L. Darling-Hammond, & G. Sykes(Eds.), *Teaching as the learning profession: Handbook of policy and practice* (pp. 54-85). San-Francisco: Jossey-Bass.

Ludwig-Hardman, S., & Woolley, S. (2000). Online learning communities: vehicles for collaboration and learning in online learning environments. In *proceedings of world conference on educational media, hypermedia and telecommunication*, 2000 (pp. 1556-1558)

Markel , S. L. (2001). Technology and education online discussion forums: It's in the response. *Online Journal of Distance Learning Administration*, 4(2), Retrieved from http://www.westga.edu/~distance/ojdla/summer42/markel42.html

Marshall, C., & Rossman, G. B. (2011). *Designing qualitative research* (5th ed.). Los Angeles, CA: Sage.

Park, I., & Kim, M. (2000). Impact of anonymity on demonstration and negative statement in synchronous virtual discussion. *Korean Journal of Educational Technology, 16*(4), 91-106.

Paulus, T., & Scherff, L. (2008). "Can anyone offer any words of encouragement?": Online dialogue as a support mechanism for pre-service teachers, *Journal of Technology and Teacher Education, 16(*1), 113-136.

Pea, R. D. (1993). Practices of distributed intelligence and designs for education. In G. Salomon (Ed.) *Distributed Cognitions*. Cambridge, United Kingdom:

Cambridge University Press.

Smith, J.B. (1994). *Collective intelligence in computer-based collaboration*, Hillsdale, NJ: Lawrence Erlbaum Associates.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wideen, M., Mayer-Smith, J., & Moon, B. (1998). A critical analysis of the research on learning to teach: making the case for an ecological perspective on inquiry. *Review of Educational Research, 68*(2), 130-178.

Figure 1. Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing (Gunawardena, Lowe, & Anderson, 1997)

PHASE I: SHARING/COMPARING OF INFORMATION. Stage one operation includes:

A. A statement of observation or opinion [PHI/A]
B. A statement of agreement from one or more other participants [PHI/B]
C. Corroborating examples from one or more other participants [PHI/C]
D. Asking and answering questions to clarify details of statements [PHI/D]
E. Definition, description, or identification of a problem [PHI/E]

PHASE II: DISCOVERY AND EXPLORATION OF DISSONANCE OR INCONSISTENCY AMONG IDEAS, CONCEPTS OR STATEMENTS.

(This is the operation at the group level of what Festinger ( ) calls cognitive dissonance, defined as an inconsistency between a new observation and the learner's existing framework of knowledge and thinking skills.) Operations which occur at this stage include:

A. Identifying and stating areas of disagreement [PHII/A]
B. Asking and answering questions to clarify the source and extent of disagreement [PHII/B]
C. Restating the participant's position, and possibly advancing arguments or considerations in its support, by references to the participant's experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate a point of view [PHII/C]

PHASE III: NEGOTIATION OF MEANING/CO-CONSTRUCTION OF KNOWLEDGE

A. Negotiation or clarification of the meaning of terms [PHIII/A]
B. Negotiation of the relative weight to be assigned to types of argument [PHIII/B]
C. Identification of areas of agreement or overlap among conflicting concepts [PHIII/C]
D. Proposal and negotiation of new statements embodying compromise, co-construction [PHIII/D]
E. Proposal of integrating or accommodating metaphors or analogies [PHIII/E]

PHASE IV: TESTING AND MODIFICATION OF PROPOSED SYNTHESIS OR CO-CONSTRUCTION

A. Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture [PHIV/A]
B. Testing against existing cognitive scheme [PHIV/B]
C. Testing against personal experience [PHIV/C]
D. Testing against formal data collected [PHIV/D]
E. Testing against contradictory testimony in the literature [PHIV/E]

PHASE V: AGREEMENT STATEMENT(S) APPLICATION OF NEWLY CONSTRUCTED MEANING

A. Summarization of agreement(s) PHV/A]
B. Applications of new knowledge [PHV/B]
C. Metacognitive statements by the participants illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of the conference interaction [PHV/C]

Table 2 The Comparison of Percentage of Incidents

Phases	Terry Anderson (1997)	Kim & Lee (2013)
Phase I	93%	35%
Phase II	2%	23%
Phase III	2%	15%
Phase IV	2%	4%
Phase V	2%	31%

This type of collaboration allows students to become â€˜expertsâ€™ in their assigned topic. Students then return to their primary group to educate others. Strategies here include using clusters, buzz groups, round-robin, leaning cells, or fishbowl discussions.Â Real world problems can be used to facilitate project-based learning and often have the right scope for collaborative learning. 12. Focus on enhancing problem-solving and critical thinking skills. Design assignments that allow room for varied interpretations.Â Try to use a step-by step procedure for problem-solving. Mark Alexander explains one generally accepted problem-solving procedure: Identify the objective. Set criteria or goals. Problem-solving is the ability to identify and solve problems by applying appropriate skills systematically. Problem-solving is a processâ€”an ongoing activity in which we take what we know to discover what we don't know. It involves overcoming obstacles by generating hypo-theses, testing those predictions, and arriving at satisfactory solutions. Problem-solving involves three basic functionsÂ It provides students with opportunities to use their newly acquired knowledge in meaningful, real-life activities and assists them in working at higher levels of thinking (see Levels of Questions). Here is a five-stage model that most students can easily memorize and put into action and which has direct applications to many areas of the curriculum as well as everyday life: Expert Opinion. Problem-solving skills and techniques: tips on how to develop and demonstrate them to graduate employers.Plus: problem-solving interview questions and assessment exercises.Â Problem-solving exercises and tests for graduate jobs. Different tests that employers could set to gauge your problem-solving skills include: Online aptitude, psychometric and ability tests.Â But, then, English literature students may also encounter academic problems, such as difficulties in tracking down the best source material. Some professional bodies (for example, those in construction) run competitions for students, which often ask students to suggest solutions for problems facing the industry; entering these can provide good evidence of your problem-solving skills. Students used higher order thinking skills of planning and problem solving. Yang found this technology enhanced inquiry project challenged learners to conduct inquiry while facilitating the development of: â€¢ historical thinking â€¢. computer literacy â€¢. critical thinking â€¢. problem solving â€¢. interpersonal skills â€¢. teamwork skills.Â and develop collaboration skills. They further argue that the use of blogs can engage students in in-depth learning, engagement and participation. Hirose (2009) adds that blogs can easily be used to have students develop higher order thinking skills such as evaluation-based thinking.Â Simply adding technology use into traditional based teaching methods may only produce minimal results, if any. Problem-solving skills help you determine the source of a problem and find an effective solution. Although problem solving is often identified as its own separate skill, there are other related skills that contribute to this ability.Â Acquire more technical knowledge in your field. Depending on your industry, it may be easier to solve problems if you have strong working technical knowledge. You can more technical knowledge through additional coursework, training or practice.Â You can find professional practice books for your industry and problem-solving scenarios online. Practice how you might solve those problems and determine if your potential solutions are viable.Â Related: Problem-Solving Games for Problem-Based Learning at Work.