Technologies for Supporting Reflective Thinking

Yansıtıcı Düşünmeyi Destekleyici Teknolojiler

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Abstract: Preservice teachers gradual transformation from student to professional teacher requires examination of their previous beliefs and knowledge, understanding of their students and context of teaching, and thoughtful deliberation about their approaches to teaching. In the last two decades numerous commissions, boards, and governments in all over the world have identified reflective thinking as a means of addressing problems in teacher education and reflective thinking became a standard for teacher education programs (Rodgers, 2002). But developing the habit of reflective thinking is not easy and without appropriate support, students have difficulty in developing the habit of reflective thinking (Lin, Hmelo, Kinzer, & Secules, 1999). Emerging technologies like digital video, multimedia cases, computer mediated communication tools, blogs, wikis, social networking and simulation programs are being used to promote reflective thinking. These technologies provide important facilities for increasing reflectivity of inservice and preserviceeachers, like vicarious field experiences, communication media for sharing perspectives and supervising or reviewing and reframing practice but these tools should be implemented considering the context of teaching/ learning situation, the needs of learners and research findings. This paper aims to synthesize research findings and will try to answer how technology could be used to support reflective thinking in preservice and inservice teachers.
Keywords: *Reflective thinking, Digital Technologies, Preservice Teachers*

Özet: Öğretmen adayları için öğrencilikten öğretmenliğe dönüşüm aşamalı bir süreçtir. Bu süreç öğretmen adaylarının önceki bilgi ve inanışlarını sorgulamaları, öğretimin bağlamı ve öğrencilerle ilgili bir anlayış oluşturmaları ve kendi öğretim yaklaşımları üzerinde derinlemesine düşünmelerini gerektirir. Son yirmi yılda tüm dünyada birçok meslek birliği, hükümet ve komisyon yansıtıcı düşünmeyi öğretmen yetiştirme sürecindeki sorunlar için bir çözüm önerisi olarak önermişler ve yansıtıcı düşünme, öğretmen yetiştirme programlarının önemli bir bileşeni haline gelmiştir (Rodgers, 2002). Bununla birlikte yansıtıcı düşünmenin geliştirilmesi kolay değildir. Öğretmen adayları uygun destek sağlanmazsa yansıtıcı düşünme alışkanlığı edinmekte güçlük çekmektedirler (Lin, Hmelo, Kinzer, & Secules, 1999). Son dönemde ortaya çıkan video, çokluortamlar, bilgisayara dayalı iletişim araçları, bloglar, wikiler, sosyal ağlar ve benzeşim programları gibi teknolojiler yansıtıcı düşünmeyi desteklemek amacıyla kullanılmaktadır. Bu teknolojiler yansıtıcı düşünmeyi desteklemek için sanal alan deneyimleri, uygulama deneyimi sürecini yönetmeye, değerlendirmeye ya da süreçle ilgili farklı bakış açılarını tartışmaya olanak sağlayan iletişim ortamı gibi olanaklar sunmaktadırlar. Ancak yansıtıcı düşünme sürecinin desteklenebilmesi için bu teknolojilerin öğrenme/öğretim bağlamı, öğrenci gereksinimleri ve ilgili araştırma sonuçları göz önüne alınarak kullanılması gerekmektedir. Bu çalışmada yansıtıcı düşünme ile ilgili araştırma sonuçları sentezlenerek teknolojinin öğretmen adayları ve öğretmenlerin yansıtıcı düşünme süreçlerini desteklemek için nasıl kullanılabileceği sorusuna yanıt aranmıştır.
Anahtar kelimeler: *yansıtıcı düşünme, sayısal teknolojiler, öğretmen adayı*

INTRODUCTION

Tacit expert knowledge could not be conveyed to preservice teachers (Chan, 2003) even if it were possible to teach all the pedagogical and subject knowledge to preservice teachers it would still hard to say that this method could prepare preservice teachers for ambiguities and complexities of real classrooms. Thus, traditional teacher education programs which mostly based on transmitting knowledge to teachers to be applied in future practice could not be an adequate method for training teachers. One approach suggested that teaching should be thought as craft and practice should become

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the core of teacher training programs. In this perspective, practice has been perceived as a way of creating pedagogical knowledge and applying theoretical knowledge to real situations. However, experience alone is also not enough for being a good professional teacher (Ferry, 1995). According to Dewey (1933) preservice teachers should be thoughtful and active learners who learn from experience rather than just proficient craftsmen. Dewey (1933) makes a distinction between the reflective and routine action. Dewey describes reflective and routine action as: "Reflective action entails the active, persistent and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the consequences to which it leads. Routine action is guided primarily by tradition, external authority and circumstance". Roots of reflective thinking could be traced back to ancient greek but Dewey is acknowledged as the "key originator"of the concept of reflection (Zeichner & Liston, 1996; Hatton &Smith, 1995). After Dewey, various researchers (Schon, 1983; 1987; Mezirow, 1991) tried to add dimensions and define reflective thinking. However, it is still hard to say that there is consensus about the term reflective thinking. Though, a formal consensus definition has not been established, many studies reference Dewey's definition as the essence of the concept. Dewey (1933) defined reflection as "*active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends*".

When teacher candidates enter the teaching education programs they bring an extensive educational and non-educational history which had shaped their beliefs about teaching (Hauge & Wittek, 2002). These experiences become a framework for preservice teachers and affect their interpretation of pedagogical knowledge, their field observations and practice. Zeichner and Liston (1996) suggested that generally preservice teachers do not change their perception about teaching and teacher during teaching education. It is thought that reflective thinking could help the solution of this problem. Because, reflective thinking requires questioning previous views, subjects these views to critical analyses and serve as a catalyst to reconstruct prior beliefs and understandings (Calandra, Dias & Dias, 2006; Korthagen, 2001). Therefore, reflective thinking is being accepted as one of the most important things to teach in teacher education faculties.

In the last two decades numerous commissions, boards, and governments in all over the world have identified reflective thinking as a means of addressing problems in teacher education and reflective thinking became a standard for teacher education programs (Rodgers, 2002). But developing habit of reflective thinking is not easy. La Boskey (1994), states that only % 20 of the teachers is naturally disposed to think reflectively. In a similar vein Lin, Hmelo, Kinzer and Secules, (1999) stated that without appropriate support, students have difficulty in developing habits of reflective thinking.

Conventional teaching practices could be inadequate and inefficient for engaging today's preservice teachers in reflective thinking activities. Today's preservice teachers needs a learning environment which allows authentic experiential learning, multiple interactions, instant responses and visual representations (Brent, 2010). Digital technologies provide opportunities for interaction, experiencing realistic learning activities, storing and manipulating data, record, store, and access resources and data for review, sharing ideas and collaboration, and immediate feedback through multiple modalities (Brent, 2010; Rhine & Bryant, 2007). In this context emerging technologies such as multimedia cases, online discussion tools, e-portfolios and digital video editing tools, are being used to promote reflective thinking. The aim of this study was to investigate research findings about the role of these tools in aiding teaching/learning reflective thinking and give teacher educators a detailed guide about how to use which tools to teach preservice teachers thinking reflectively.

Multimedia Cases

Cases defined as richly detailed, contextualized and well-documented narrative events (Shulman, 1992) that enable preservice teachers to experience and analyze the complexity of the classroom life without taking risks of real classroom teaching in a firm, relaxed setting (Beck, King & Marshall, 2002). Cases could structure classroom observations, so that enable preservice teachers to "bridge the gap between theory and practice" and promote habits of reflection (LaBoskey, 1994). In field experiences, preservice teachers observe routines of the classroom but cases generally focus on ''*the problematic, unique situations that call for* reflection*, analysis, and the continued inquir*y'' (Sykes & Bird, 1992).

Traditional written cases could be described as real stories or fictious scenarios which is shaped by case writers. Written cases are created considering a predefined teaching purpose. It is criticized that written cases carry the writer's opinion about the case and convey writer's interpratation of the case to preservice teachers. That's to say, case writer defines what to analysis and where to focus on.In addition, written cases contain limited and purposeful background information about the context of cases and this limits the analysis of preservice teachers (Lynn, 1999). On the other hand, new case formats like video cases and multimedia cases gives a more objective image of case and much more background knowledge about the case than written cases. Detailed, authentic and objective nature of multimedia cases provides a suitable environment for reflection (Perry, 2000). Multimedia cases also allow to transmit nonverbal cues like gestures, postures, tone of voice. These cues which is hard to convey in a text could be crucial to one's understanding of the case (Beitzel & Derry, 2004). Sherin (2004) suggested that ,''*Video allows one to enter the world of the classroom without having to be in the position of teaching in-the-moment'*.

However, in order to enhance reflection, simply showing multimedia cases to teachers and expecting them to analyze the case, discuss and think reflectively on case would be an ineffective approach. Educators or instructional designers need to decide what video cases should include and how multimedia cases should be structured. However, there is a lack of research which could shed light on the issue of designing cases. Generally preservice teachers are lack of adequate repertoire for selecting which part to focus on cases. Structuring multimedia cases could help preservice teachers to define problems to discuss and reflect. One approach for structuring multimedia cases is adding case teachers' reflection and expert opinions on problematic segments in multimedia case. According to Levin, He and Robbins (2006), "*good cases should foster multiple perspectives to serve as catalysts for problem solving and critical thinking, which can in turn promote critical reflection*." Rowley and Hart (1996), suggested that pausing video cases in predefined complex and conflicting points for creating time for case discussions could be a productive approach. Özçınar (2009) also found that adding teacher and expert reflections on problematic parts in video cases could promote reflective thinking of preservice teachers. On the other hand, teacher educators should be aware of the possibility that preservice teachers could perceive expert and classroom teacher's reflections as the best way to analyze the situation. This could be hindering factor for reflection.

Kim, Phillips, Pinsky, Brock, Phillips and Keary (2006) in their study tried to identify strategies for developing cases, reviewing 100 studies from multiple disciplines. Kim et al. (2006) identified 5 topics and 17 strategies for developing teaching cases. Authors suggested that a video case should be "*relevant (level of learner, goals and objectives, setting of case narrative); realistic (authenticity,* distractors*,gradual disclosure of content); engaging (rich content, multiple perspectives, branching of content);challenging (difficulty, unusual cases, case structure,multiple cases), and instructional (build upon prior knowledge, assessment, feedback, and teaching aids).*"

Literature review revealed that case method is one of the most used methods for triggering reflection. But there is very limited instructional design research in this area. May be case method, stand-alone, could not create desired effect in encouraging student teachers to become reflective thinkers. However, when properly designed, multimedia cases could be the first step in teaching reflective "habit of mind". Especially in recent years web based case based learning practices are evolving (Kim et al, 2006). This allows researchers to gather data using log files and analyze students' behavior patterns in case based learning environments and decide which types of cases are most productive in promoting reflective thinking.

E-Portfolio

In reflective thinking literature, portfolio is one of the most mentioned tools for promoting reflective thinking (Zeichner & Wray, 2001; Darling-Hammond & Snyder, 2000; Wade & Yarbrough, 1996; Loughran & Corrigan, 1995; Mansvelder-Longayroux, Beijaard, & Verloop, 2007). Farr Darling (2001) defined portfolio as " *a narrative that tells a coherent story of your learning experiences in the program, and highlights thoughtful reflection on, and analysis of, those experiences*." Technological advancements affected the way portfolios produced. E-portfolios which allow more flexible structure replaced print portfolios. E-portfolios, could include various technologies like; web logs ('blogs'), reflective journals, online discussions, and digital storytelling,. It is widely acknowledged that when portfolio prepared by isolated preservice teachers, effects of process on enhancing reflective thinking could be very limited. In order to support preservice teachers reflective thinking, they should be provided opportunities for interacting with their supervisors, mentors and peers (Zeichner & Wray, 2001). E-portfolios provide opportunity to see who have accessed to their portfolio and how long, which elements of their portfolio viewed or commented most. Therefore, preservice teachers could get immediate feedback for their work. Preservice teachers generally tend to put all the materials at he last minute before due date rather than developing their portfolios on step-by-step manner (Lin, 208). Always shared nature of e-portfolios provide opportunity for teacher educators to monitor the development of portfolios along the way.

In order to succeed promoting reflective thinking using e-portfolios, preservice teachers should be trained about the aim of constructing e-portfolios. Portfolio construction is an open-ended process and without developing a shared language about this process and clarifying portfolio's purpose and the process, portfolio development could return to a frustrating work. Preservice teachers' confusion and misunderstanding could hinder them to value and enjoy the portfolio process (Pimentel, 2010; Wade & Yarbrough, 1996). In the e-portfolio construction process every student choose a way to tell his/her story (Chen et al., 2002). They take ownership of the process and decide about both content and form of their e-portfolios. This "is in itself a reflective process" and desired for educators, However, explaining required assignments and time-schedules can provide some structure and could be helpful for preservice teachers (Wade & Yarbrough, 2006). Darling (2001), emphasize that task of creating portfolios, describing the experiences, which is "fluid and murky", is not an easy task without any scaffolding. Structuring the process of creating portfolio could be useful in both helping preservice teachers to describe their journey and increasing their awareness and reflectivity. Fort hat reason, the way portfolios structured, scaffolded and contextualized is significant for the success of the method (Hauge and Wittek, 2006).

Teacher educators should be experienced in portfolio development process, they need to know how to bring the mentors, faculties and students to shared understandings of e-portfolios and how they can create a shared language about the e-portfolio throughout the teacher education. "*Before engaging preservice teachers in learning activities to develop their e-portfolio, faculty have to build a common*

interest and commitment to integrating the e-portfolio into their courses"(Pimentel, 2010). Preservice teachers should have a clear understanding about the value of portfolios in their learning. Imhof and Picard (2009) stated that unless portfolio perceived as an integral part of the course, preservice teachers could perceive portfolios as a time consuming task which creates an extra workload. Creating a coherence within faculties and between university and school in order to developing a joint purpose and process related to the e-portfolio development could help in constructing a shared repertoire for developing the e-portfolio and decrease workload of preservice teachers (Pimentel, 2010).

Journal writing is generally accepted as an important dimension of e-portfolios. However, most of the researchers describe preservice teachers' reflective journals as descriptive, shallow and unfocused. This attributed to factors such as preservice teachers' limited understanding of the concept of reflection, lack of reflective writing experiences and lack of sufficient guidance from teacher educators (Lai & Calandra, 2007) and perceiving portfolios as a time consuming task (Imhof & Picard, 2009). E-portfolios provide tools, such as online discussions and blogs, for eliminating these critics. For example, online discussions could provide a tool for providing teacher guidance. On the other hand, lack of experience in reflective writing could be compensated with scaffolds that hold the potential to enhance preservice teachers' reflective journal writing (Lai & Calandra, 2007). In e-portfolios blogs replace traditional teaching diaries or reflective journals. According to Richardson (2003), blogs are "a *way to communicate with students …, archive and publish student work, learn with far-flung collaborators, and 'manage' the knowledge that members of the school community create*" . Research findings show that blogs promote reflective practice (Efimova & Fiedler, 2003). When interactivity considered blogs could be placed somewhere between traditional reflective journals and online discussions. Blogs allow RSS feeds and comments but this is limited relative to the online discussions. Tan (2006) suggested that if the aim is promoting collaborative reflection online discussions could be better on the other hand if individual reflection aimed blogs could be a better choice. Blogs, beside the interactivity they provide, enhance sense of ownership.

Student perceptions about e-portfolio development are not the same. Teachers' technological competencies and other individual characteristics have an impact on how preservice teachers perceive e-portfolios (Lin, 2008). Hauge (2006) suggested that "there is a positive connection between the portfolio work, community learning and online learning activities, but the intensity of this relation depends on students' motivation and technological skills. These findings underlines that the major program artifacts (portfolio and ICT) enter into different relationships with the students according to their individual characteristics. It is largely acknowledged that e-portfolios could enhance reflective thinking of preservice teachers. However, in order to be able to design more efficient activities specific qualities of the portfolios by individual characteristics in teaching process have to be investigated.

Digital video editing tools provide new opportunities for reflection especially in the analysis of field experiences. Advancements in video technology make it possible for preservice teachers to easily collect, review, and manipulate video segments (Cunningham & Benedetto, 2002). This enables preservice teachers to make decision about which segments to choose and allow them to take a more objective view in order to better study teaching and learning (Van Es & Sherin, 2002). In other words, preservice teachers could create their audio visual diaries using digital video tools. In this process, when editing videos, preservice teachers view the video again and again (multiple times). Every time a teacher view a video could get a chance to focus on a new dimension in video case. And as a result of this, teachers could reflect on case from different perspectives (Beck, King and Marshall, 2002). From another point of view, Yerrıck, Ross, & Molebash (2003) states that when preservice teachers write their reflections about their field experiences, their reflections are shaped by "their own perceptions", memories and desires present a positive image. When preservice teachers watch their experiences on

VHS video, they typically watch it once and their reflections remains descriptive and shallow. But digital video editing entails extended engagement with their own teaching experiences. Thus, they spent more time on watching their experiences and think more critically about how their practice aligns with their beliefs . Despite the potential of digital video Technologies in promoting reflective thinking it is widely acknowledged that this process should be structured and scaffolded in order to promote reflection (Chula 2001) claims that giving predefined criteria for selecting clips from a longer video, could bring teachers a framework for examining classroom teaching. However, educators should avoid being to prescriptive and constraining the potential of the teacher to identify salient moments of teaching (Calandra, Dias & Dias,2006). Reflective prompts or video annotations also would be a productive technique to enforce reflective thinking of preservice teachers.

Online Discussions

Our beliefs and ideas only become clear to us when we articulate them. When speaking about thoughts and beliefs, people are aware of the logical gaps between their ideas, strengths and weakness of their thoughts. In online discussions, preservice teachers exposed to a wider range of ideas, views and teaching resources (Darling-Hammond, 1994; Zeichner & Liston, 1996). In addition, discussions entails reflection. Some authors suggest that the lack of opportunity to discussion of ideas inhibits reflection (Solomon, 1987). Thus, mostly activities designed for enhancing reflection involves a discussion part. Discussions are accepted as vital part of case based learning and student teacher's practicum. Because in discussions student teachers speak about their previously unarticulated beliefs about teaching and learning. Thus, articulated beliefs become open for examination and re-interpretation in the light of expert and peer views and theoretical knowledge. For example in practicum, when student teachers engaged in discussions, they reflect on their practice analyze their decisions and background of decisions, feelings at the moment of decision and total performance. They compare their performance with that of peers and experts. Recent developments in technology made information and communication Technologies more affordable and accessible. Today, thanks to ICT, students having the chance of communicating with their peers and instructors from anywhere and anytime. And also they have a chance to access a tremendous information source within a discussion. Harrington and Hathaway (1994) found that online discussions would provide privacy to students so that students could participate anonymously and this leads a non-threatening environment which students could freely exchange their ideas and make explicit their beliefs about teaching and learning". Electronic communication tools save a copy of the conversation so gives participants opportunity to retrospectively investigate their own ideas and reflect on their idea transformation.

Learning environments which aimed to promote reflective thinking generally choose asynchronous communication environments. Because in asynchronous communication environments participants have time for thinking on case and other ideas and developing their own stance (Hara, Bonk & Anjeli, 2000). On the other hand, Levin, He and Robbins (2006) found that in synchronous case discussions students had a higher level of reflection than asynchronous case discussions. In their study, Levin, He and Robbins (2006) asked 36 students their preferences about the case discussion format. 33 students preferred asynchronous case discussions stating that asynchronous communication could provide more time to think, more flexible time Schedule to participate. Only three students initially preferred synchronous discussions. Students' reasons for their preferences were: liking having a time Schedule for discussion, getting immediate feedback in discussions and thought that other students' responses will inspire their own thinking. But at the end of the course 17 student preference was synchronous communication. The reasons offered by them for their preference were: "a) immediate feedback from peers and the professor; (b) the pace of the discussions, which they said felt

more like a real conversation; (c) the convenience of having a one-hour chat, rather than having to check many times during the week to see how the asynchronous discussion was progressing; and (d) being challenged to think intensely and learn from peers in a short time frame.". Levin, He and Robbins () suggested that both asynchronous and synchronous tools should be provided to students in order to make them to experience each medium's unique affordances.

Moderators play a major role in structuring online discussions and facilitating reflective thinking. However, who should manage the discussion and how should he/she behave in discussion in order to promote reflective thinking is a matter of debate. Levin, He and Robbins (2006) found that, while instructor facilitated discussions perceived as more focused and task-oriented than peer facilitated discussions, peer facilitated discussions perceived more relaxed. Levin, He and Robbins (2006) suggest that; peer facilitators should be provided well prepared guides and informed about aim of online case discussions. Also, groups should be informed about who is the facilitator and what should be expected from peer facilitator. Lee (2008) found that, students were agreed on the necessity of educators' participation in online discussions but their thoughts were different on needed participation frequency of educators. In literature it is largely acknowledged that, role of tutors or facilitators in discussion groups should fade in time. According to this view tutor's role should switch from 'model' to 'coach' when preservice teachers become more experienced in analyzing teaching events. In "modelling" phase tutors summarize and rephrase dialogues, explores theoretical concepts, by rephrasing, and show similarities and differences in the arguments. In coaching phase, tutors make suggestions to facilitate a more productive and reflective discourse and rarely intervene discussion (De Smet, Van Keer, De Wever & Valcke, 2010).

In order to promote reflective thinking, online discussions should be well structured (Harrington & Hathaway, 1994; Stamper, 1996; Whipp, 2003). Stamper (1996) states that "*engaging in reflective thinking, rather than allowing our minds to wander aimlessly, requires deliberate focusing*". According to Stamper "*explicit guidelines*" could be very helpful in focusing preservice teacher's thoughts on problems which require reflection. This "explicit guidelines" should be "*open ended enough to allow students to create their own meaning yet structured enough to help them get started* " Whipp (2003) found that when discussing field experiences in online discussions "tailored" and general questions about sociopolitical and moral issues which is asked by educators or peers can encourage higher levels of reflection. Some authors states that structuring online discussions could make them more productive but these authors also warn that too much structure could inhibit social functions of discussions decrease reflection (Admiraal et al., 1997; Schlagal et al., 1996).

Some researchers found that,in online discussions the length of threads (McIntyre and Tlusty, 1992) and message count decreased over the semester. Researchers give various explanations for interpreting this problem. For example, McIntyre and Tlusty (1992) , interpreted this as a consequence of increasing demand of other progressing lessons. Another explanation was technical difficulties and problems (Cifuentes, Murphy, Segur, & Kodali, 1997; Stamper, 196) According to stamper technical problems cause some students to get bored and quit the discussion. For attracting student participation, some authors emphasize the role of facilitator. For example Cifuentes, Murphy, Segur, & Kodali, (1997) suggested that the facilitator role should involve helping students overcome technical problems. Beaudin, (1999) claimed that the facilitator should try to keep the discussions on track by providing discussion summaries, designing steering questions and rewording the questions when discussion go off topic. According to another approach, (Tagg & Dickinson, 1995), the facilitator should behave as encouraging, prompting a response to students' contributions, responding directly individual student rather than the whole group. In addition, it is also argued that explaining what is expected of preservice teachers in discussions could improve participation (Dennen, 2005).

Conclusion

Literature review revealed that using digital technologies provide affordances which could promote reflective thinking. Brent (2010) summarizes characteristics of technology that supported reflective teaching practices as: *"(a) relative ease and speed; (b) ability to facilitate a variety of ways for feedback; (c) ability to record, store, and access resources and data for review; (d) provide systematic data to analyze trends and common features; (e) ability to organize and make changes as needed; and (f) ability to facilitate communities for discussion, sharing, and collaboration*". However, providing technology to preservice teachers and expecting them to use these technologies in an efficient means to promote reflective thinking is not a realistic approach. Teacher educators should carefully structure activities and use scaffolding techniques for helping preservice teachers to develop reflective thinking habits.

Familiarity and comfort in using technology are two of the most important elements effecting the success of technology mediated reflective thinking activities. If preservice teachers are not competent in technology use, or digitally literate, technology, in itself, returns to a problem rather than a tool used in problem solving. Beside that, technical problems like viruses, constitutes another problem. This kind of problems decreases preservice teachers motivation to use technologies for reflective thinking activities. The privacy issue is another thing to consider when using technologies for reflective thinking activities. Teacher educators should be aware of the ethical consequences of sharing opinion and resources on the internet.

There are lots of studies on technology use for promoting reflective thinking. However, most of them theoretical or comparing effect of a technological tool use with conventional methods in promoting reflective thinking. But in order to help teacher educators to design reflective thinking activities with technological tools there is a need to researches which investigate the relationship between different technologies and characteristics of context and students. Also researches which investigate preservice teachers' perceptions regarding various technologies could be very beneficial for teacher educators.

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