Preparing Teacher and Student for Twenty-First-Century Learning Practices: A Framework for Enhancing Collaborative Problem-Solving and Strategic Learning Skills

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ABSTRACT: *Regarding the growing interest in developing teacher education to match the twenty-first-century skills, while many assumptions have been made, there has been less theoretical elaboration and empirical research on this topic. The aim of this article is to present our pedagogical framework for the twenty-first-century learning practices in teacher education. We will first review the current status of policy frameworks for the twenty-first-century learning skills. Based on our previous work and current understanding in the field of learning sciences, we will next elaborate the processes and strategies for collaborative problem-solving skills and strategic learning skills to specify current, rather general claims presented regarding the discussion on twenty-first-century skills. We will also provide concrete case examples facilitating strategic learning skills, collaborative problem-solving skills, and the skills to use information and communication technologies in contexts of our previous studies.*

INTRODUCTION

Success in life and work in today's knowledge society calls for twenty-first-century skills, i.e. skills for learning, creative and critical thinking, collaboration, and the ability to utilize ICT (Information and Communication Technologies) in these areas (Binkley et al., 2012). It is assumed that upon embarking on their university studies, pre-service teachers have strong experiences of self-discovery, inquiry-based approaches, and critical thinking that they have adopted while using the Internet. Hence, it is often assumed that they should be able to face the challenges of the lifelong and life-wide learning of a learning society and future schooling.

However, today's student population is not a homogeneous group, which raises challenges for teacher education. On the one hand, the current pre-service teachers can have a strong potential

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for critical thinking and collaboration. On the other hand, not all of these students are necessarily ready to be part of an inquiry-based, collaborative learning culture. Many students are the result of traditional school culture which strongly influences their assumptions regarding good teaching models, i.e. models featuring a traditional teacher-led approach (Mäkitalo-Siegl, Kohnle, & Fischer, 2011; Schratzenstaller, 2010; Webb & Mastergeorge, 2003). Hence, there is a need to develop new teaching methods and assessment tools in order to better equip citizens to be able to function in this knowledge society (see Krokfors et al., 2011; Välijärvi, 2011). We believe that teacher education could be a powerful channel for triggering long-term change in the field. In order to trigger change in schooling, pre-service teachers first need to learn how to adapt to the new learning culture by themselves as students. The foundational underpinning in our research is the socio-cognitive model of learning (Zimmerman, 2010) that emphasizes learning as a complex metacognitive and social process involving adaptive thinking, motivation, emotion, and behavior. Accordingly, we view learners as active agents who can take control of their own learning processes, but also facilitate the others' learning (Sawyer, 2014).

One of the most well-known learner-centered pedagogical approaches is the one of inquiry-based learning. Earlier studies have indicated variation in inquiry-based pedagogical approaches and mixed results on the effects of inquiry-based learning (Casotti, Rieser-Danner, & Knabb, 2008; Hmelo-Silver, Duncan, & Chinn, 2007; Loyens, Kirschner, & Paas, 2010; Rybarczyk, Baines, McVey, Thompson, & Wilkins, 2007; Wilhelm, Sherrod, & Walters, 2008). Hence, there is a need for a systematic scientific approach in order to measure the impact of instruction based on inquiry in education. Furthermore, more research is needed for developing theoretical understanding of inquiry-based learning models and their practical implementation among pre-service teachers being in a central role in developing future schooling.

With regard to the growing interest in developing teacher education to match the twenty-first-century skills, while many assumptions and claims have been made (Binkley et al., 2012; Voogt & Pareja Roblin, 2010), there has been less theoretical elaboration and empirical research on the role of strategic learning skills and collaborative problem-solving (CPS) as a part of inquiry-based pedagogical designs. We will answer these challenges by developing a theory-based pedagogical framework, driven by socio-cognitive approach to learning, which aims to promote pre-service teachers' twenty-first-century learning skills as part of our research project 'Preparing teacher students for the 21st century learning practices'. This framework will be utilized in our future research designs. The aim of this article is to outline the pedagogical designs for learning practices in which the central elements are strategic learning skills, collaborative problem-solving skills, and the skills to use ICT. For grounding the arguments, we will first review and discuss the current status of policy frameworks for the twenty-first-century learning skills. Based on our previous work and current understanding in the field of learning sciences, we will next elaborate the processes and strategies for CPS skills and strategic learning skills to specify current, rather general claims presented regarding the discussion on twenty-first-century skills. Then, we will present our pedagogical framework for the twenty-first-century learning practices in teacher education. And

finally, we will provide concrete case examples facilitating these skills in contexts of our previous studies.

Objective of the Study
1- To identify the role of collaborative problem-solving and strategic learning skills
2- To know what is meant by twenty-first century skills.
3- To compare teacher and student performance pre and post experiencing of getting to know these skills.

Research Questions
1-Do twenty first century skills are important for student and and teacher?
2-Can collaborative problem –solving and strategic learning enhance teacher and student performance?
Research Hypothesis:
1-Twenty first century skills are important for teacher and student.
2-Collaborative problem-solving and strategic learning skills enhance both teacher and student performance.

Significance of the study:
This study offers contributions to the field of English language Teaching (ELT) in this ways:
Firstly: It improves teaching practices of teachers therefore teaching outcomes will be high.
Secondly: This research paper provides teacher and student with new insights about ways of teaching and learning language.
Thirdly: It provides better understanding of policy makers on the University English Language Teachers situations in order to build coherent strategic plans.

Limits of the study:
Time: February 2020, Location: Kingdom of Saudi Arabia, Abha, King Khalid University.Faculty Pedagogical Designs for 21st Century Teacher Education In this section, we will elaborate the core features of our pedagogical approach for teacher education. Promoting collaborative problem solving and strategic learning skills, especially socially shared regulation of learning, presumes situations where students face learning challenges. In order to be strategic, learners need to have an opportunity to activate their own problem exploration and participation (Malmberg, Järvenoja & Järvelä, 2013). This is also the case in the regulation of learning. Challenge situations stimulate students to regulate and change their strategic activity. Without challenges there is no need for the regulation of learning (Hadwin et al., 2011). There is also an emphasis in the framework of the socioconstructivist perspectives of computer-supported collaborative learning (Brown, Collins, & Duguid, 1989; Scardamalia & Bereiter, 2006) on the need for learners to be engaged in solving authentic, ill-structured, and complex problems for deep learning to take place. We know that this kind of work is not easy; furthermore, achieving learning with understanding and high-level collaboration is not self-evident, and this is especially true in minimally structured learning environments (Kirschner et al., 2006). Inquiry-based instructional approaches are often referred to

as learner-centred, which requires the learner to observe, generate questions, discover gaps in one's knowledge base, and study resources to try to overcome these gaps (Hmelo-Silver, Chinn, Chan, & O'Donnell, 2013).

In order to change the student's passive role as a receiver, inquiry-based teaching comprises a whole spectrum of instructional techniques which offers a variety in the degree of use of inquiry practices, such as generating questions and giving and evaluating 14 explanations (Chi, Bassok, Lewis, Reimann, & Glaser, 1989). In our approach, we will focus on the process of inquiry from a pedagogical perspective, and we treat inquiry as a method for structuring activities in the study contexts, especially focusing on inquiry-based instructional formats such as problem-, project-, and case-based learning approaches. All these instructional approaches require student control; the students take responsibility for their learning process (Dochy, Segers, Van den Bossche, & Gijbels, 2003; Mäkitalo-Siegl & Fischer, 2013; Savery, 2006) and regulation of learning (Hadwin et al., 2011). Students need to plan learning activities, monitor progress, and evaluate their progress on a regular basis, both individually and collaboratively, and these activities are closely related to strategic learning skills. Also, all inquiry-based instructions work with meaningful tasks, whether they are questions, problems, projects, or cases, and therefore activities are placed in a realistic context for students. Earlier studies have shown both positive and some mixed results when studying the effects of inquiry-based learning approaches (Gijbels et al., 2005; Hmelo, 2004; Kirschner et al., 2006).

REVIEW OF LITERATURE

Why collaborative learning?
To succeed in the knowledge society, learners and knowledge workers need to (more often and more effectively) combine their expertise and ideas in various collaborative situations, solve problems, and create new information and knowledge. Both formal training settings and everyday learning environments require the use of social skills and the ability to commit to coordinated work with co-learners. The following three sides of collaborative learning are represented in our approach: (1) collaborating to learn (collaborative learning environments to trigger productive learning mechanisms); (2) learning to collaborate (collaboration skills as such); and (3) learning to teach by applying collaborative learning approaches. It is further argued that it is especially critical to apply collaborative learning in the context of teacher education. Applying new pedagogical approaches in teaching and changing the ideas, thoughts, and habits about teaching and learning is challenging because there is a long history of teacher-led approaches (Bakkenes, Vermunt, & Wubbels, 2010; Mäkitalo-Siegl et al., 2011). Also, recent research has shown that Finnish secondary school students (aged 11–15 years) rank collaboration the highest in importance among listed twenty-first-century skills (Ahonen & Kinnunen, 2015). In addition, a quarter of those students mentioned social skills as the most important things they had learned in life so far. For these reasons, the 'learning to collaborate' aspect is advocated as highly important among pre-service teachers in order to develop collaboration skills and the capacity to collaborate also among their future students in the schools.

Why is collaborative learning then beneficial in terms of learning? At its best, collaborative learning can foster productive interactions and learning activities, such as questioning, explaining and justifying opinions, articulation, argumentation, and elaboration (Häkkinen, Arvaja, Hämäläinen, & Pöysä, 2010; Mäkitalo-Siegl, Stegmann, Frete, & Streng, 2012). Our current understanding of collaborative learning leans on analyzing interactions as a means of gaining insight into the social and cognitive processes of collaborative learning (Barron, 2003; Dillenbourg, 1999). Furthermore, knowledge sharing is an important construct to be used to understand the relationship between individual knowledge construction and how the participants share knowledge and create joint understanding (Jeong & Chi, 2007; Roschelle & Teasley, 1995). It has been suggested that collaborative learning takes place through processes of shared meaning-making when there is a dynamic relationship between shared meanings and individual interpretations. Through this process, learners verify and negotiate their individual views in order to reach shared understanding or group cognition (Stahl, 2005). According to Schwartz (1995), the power of collaborative learning comes from the effort necessary for the group to build a shared understanding.

Several studies have also shown the other side of the coin. A high-level collaboration does not happen naturally; people vary in the extent of their capability to collaborate with each other. Various kinds of problems have been realized in collaborating in authentic educational settings. Researchers have shown that when learners are left on their own, they rarely engage in productive interactions and knowledge-generative activities, such as asking each other questions, explaining and justifying their opinions, articulating their reasoning, and elaborating and reflecting upon their knowledge (Kobbe et al., 2007). Many things can go wrong in collaboration, and cognitive, motivational, and socio-emotional challenges may emerge (Van den Bossche, Gijselaers, Segers, & Kirschner, 2006), even when the group activity is carefully pedagogically designed (Kirschner, Sweller, & Clark, 2006). Cognitive challenges may derive from difficulties in understanding one another's thinking or negotiating of multiple perspectives (Häkkinen, 2013; Kirschner, Beers, Boshuizen, & Gijselaers, 2008; Mäkitalo, Häkkinen, Leinonen, & Järvelä, 2002). Motivational problems, in turn, can emerge due to differences in group members' goals, priorities, and expectations (Blumenfeld, Marx, Soloway, & Krajcik, 1996; Järvelä, Järvenoja, & Veermans, 2008). If collaboration is not supported well enough and/or students do not have adequate skills, productive learning does not take place and students might end up with negative learning experiences (Farrell & Farrell, 2008; Häkkinen et al., 2010; Rajuan, Beijaard, & Verloop, 2008). In sum, earlier research studies have recognized a need for supporting challenging factors of collaboration in their cognitive, motivational, and emotional regulation targets of group processes.

CPS as a way of working
Problem-solving as a specific form of collaboration has gained increasing interest due to recent educational policy initiatives. CPS will be assessed in the large-scale international assessment, PISA 2015 study (http://www.oecd.org/pisa/). In this context, it has been defined as follows:

Collaborative problem solving competency is the capacity of an individual to effectively engage in a process whereby two or more agents attempt to solve a problem by sharing the understanding and effort required to come to a solution and pooling their knowledge, skills and efforts to reach that solution. (OECD, 2013)

Especially complex problems require approaching a problem responsively by working together, exchanging ideas, and managing conflicts. The following three major competences are to be assessed in PISA 2015: (1) establishing and maintaining shared understanding and mutual knowledge; (2) taking appropriate action to solve a problem (task behavior); and (3) establishing and maintaining group organization (organization/management).

CPS leans on various social and cognitive skills that have been defined in the ATC21s project (Assessment and teaching of 21st Century skills; Griffin, Care, & McGaw, 2012). The five broad strands of CPS are as follows: (1) perspective taking (the ability to take the others' perspectives into account); (2) participation (readiness to share information and externalize thoughts); (3) social regulation (awareness of the strengths and weaknesses of group members); (4) task regulation (planning and monitoring skills for developing strategies for problem-solving and shared problem representation); and (5) knowledge building (the ability to learn and build knowledge through group interaction). These are the prerequisites for successful CPS and are utilized in our pedagogical approach for teacher education practices.

Strategic learning skills as ways of thinking

Considering the opportunities and challenges of collaborative learning and problem-solving, we will complement the pedagogical approach with current understanding of self-regulated learning, especially socially shared regulation of learning in collaborative contexts. In addition to identifying the critical processes of collaborative learning in terms of task- and content-related interactions, our focus is also to emphasize the pre-service teachers' individual learning skills.

Self-regulation and socially shared regulation are skills needed to adapt to the constantly changing learning and work contexts of the twenty-first century (Järvelä & Hadwin, 2013). When considering how to successfully facilitate and achieve active and engaging learning, it is clear that successful students regulate their own learning. Earlier research has shown that successful learners use a repertoire of strategies to guide and enhance their learning process – including cognitive, behavioral, and motivational strategies – toward completing academic tasks (Schunk & Zimmerman, 2008). Self-regulated and strategic learning involves experimenting with and learning about effective strategies for regulating (i.e. planning, setting goals, organizing, and/or monitoring) aspects of their own, peers', and groups' shared learning process (Winne & Hadwin, 1998).

Today, regulating learning is rarely a solitary task. Pressure toward active learning and engagement in shared learning situations is increasing because of complex interactions in changing learning contexts (Järvelä et al., 2008; Järvelä, Järvenoja, & Näykki, 2013; Näykki, Järvelä, Kirschner, & Järvenoja, 2014); for example, study groups, work teams, or social networks require increased

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collaborative competence (Scardamalia & Bereiter, 2006). Socially shared regulation occurs when groups regulate together as a collective, such as when they construct shared task perceptions or shared goals (Hadwin, Järvelä, & Miller, 2011). When groups co-construct plans or align monitoring perceptions to establish a shared evaluation of progress, they are engaged in shared regulation. Therefore, socially shared regulation of learning refers to processes by which group members regulate their collective activity.

Pedagogical designs for twenty-first-century teacher education

In this section, we will elaborate the core features of our pedagogical approach for teacher education. Promoting CPS and strategic learning skills, especially socially shared regulation of learning, presumes situations where students face learning challenges. In order to be strategic, learners need to have an opportunity to activate their own problem exploration and participation (Malmberg, Järvenoja, & Järvelä, 2013). This is also the case in the regulation of learning. Challenge situations stimulate students to regulate and change their strategic activity. Without challenges, there is no need for the regulation of learning (Hadwin et al., 2011). There is also an emphasis in the framework of the socio-constructivist perspectives of computer-supported collaborative learning (Brown, Collins, & Duguid, 1989; Scardamalia & Bereiter, 2006) on the need for learners to be engaged in solving authentic, ill-structured, and complex problems for deep learning to take place. We know that this kind of work is not easy; furthermore, achieving learning with understanding and high-level collaboration is not self-evident, and this is especially true in minimally structured learning environments (Kirschner et al., 2006).

RESEARCH METHODS AND DESIGN:

Research Method

In this study, both quantitative and qualitative methods were used to collect data from the selected participants (Creswell, 2007). These methods assisted in building a base on a complete understanding of the research problem. Use of both quantitative and qualitative methods together lead to a terminology known as mixed methods. Mixed methods of research are "those studies or lines of inquiry that integrate one or more qualitative and quantitative techniques for data collection and/or analysis" (Borkan, 2004) although such terminology is not as simple as it is (Sandelowski, 2000 and Bryman, 2006).

Qualitative methods

Qualitative method is defined as an inquiry process of understanding a social or human problem based on building a complex, holistic picture, formed in words, reporting detailed views of participants conducted in a natural setting (Creswell, 2007). It could also be defined as a multi-focus method, involving an interpretive, naturalistic approach to its subject matter (Denzin &Lincoln, 1994). The use of this method enabled to study things in their natural settings and related interpretations i.e. teacher‟s feelings while busy in their natural working environment, (Cohen and Morrison, 2000). In this study. Interviews were conducted with heads of English language departments.

Population and sampling

A population is a group of elements or cases, individual objects or events, that conform to specific criteria and to which we intend to generalize the results of the research (McMillan and Schumacher, 2001). In this study, the population used for was all English language teachers in King Khalid University. Sampling in this study, the sample size was 25 English language teachers selectively drawn out from all English language teachers in King Khalid University English department.

Data collection technique

Interviews

Interview is a purposeful interaction between two or more people focused on one person trying to get required information or a face-to-face encounter between the researcher and participant on lives, experiences or situations (Taylor and Bogdan, 1984; Gay, 2003). Such interviews permit to researchers to obtain important data which could not be acquired with other tools (Cohen and Morrison, 2000). In this study, open ended questions, semi-structured 1-hr long interviews were conducted with 25 English language teachers.

Interview Analysis

1-To what extent Teacher and students are ready for practicing 21st century skills?
Most of participants referred to have readiness to practice 21st centaury skills and they are willing to put in the ground.
2-How can collaborative problem-solving and strategic learning skills enhance teacher and student performance?
All participants pointed out that positive use of collaborative problem-solving and strategic learning skills enhance teacher and student performance and they are crucial in this era of technology and complicated life to get right decisions.
3-Is pre-service teacher education promoting teacher performance?
All participants agreed upon pre-service teacher education promote teachers' performance when it comes to real teaching practice.
4-Can critical and creative thinking make development in decisions of student life?
All participants have mentioned that without having critical and creative thinking skills their decisions become haphazard and not based on knowledge background
5-Does inquiry based –learning enhances teacher and student abilities to learn language properly?
Most participants have mentioned inquiry-based learning widen their students scope of mind and let them intellectual and open-minded.

CONCLUSIONS

Teacher education has been challenged by the need to enhance the new teachers' ability to implement new pedagogical approaches and take advantage of ICT for teaching and learning. Teacher education also constantly faces the challenges of disconnecting theory and practice (Korthagen & Kessels, 1999; Zeichner, 2010). Overall, the current way of working in teacher

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education does not match well enough the needs of twenty-first-century learning environments, such as inquiry-based learning approaches that focus upon collaboration and social forms of learning, as well as the use of ICT (social media, wikis, blogs, mobile technology, and/or CSCL) in teaching and learning. These, in turn, require students to have skills related to collaboration, the strategic regulation of learning, and the ability to use ICT in a rapidly changing learning society. In our approach, pre-service teachers are educated in a way they are supposed to teach their future students. In this paper, we have described some of the recent policy frameworks for twenty-first-century skills, and focused more thoroughly on the particular skill areas (CPS and strategic learning skills) that have formed the basis for our pedagogical framework in the teacher education context.

Many countries have started reforms in the mission statements of their educational systems as a result of international comparisons (e.g. PISA). There is a general notion that education and work have changed, and hence, the challenge is to educate next-generation problem-solvers and communicators. As one of the main justifications for education is to prepare our students to enter the world equipped to cope with challenging and complex problems, it is also important that our educational systems incorporate the twenty-first-century skills into curricula. It is typical that the facilitation of these skills is embedded into innovative projects and development initiatives, but the challenge is to scale them up more broadly. For example, how do we scale up inquiry-based, collaborative approaches into policy and implement them on a systemic level?

Sleeter (2014) has criticized teacher education research of not providing systematic evidence of the classroom impact of teacher education initiatives. Due to the lack of evidence, teacher education research is not capable of informing policy well enough. There is also a lack of large-scale and mixed methods studies in teacher education research. For example, there has been no systematic and long-term research on the impact of different pedagogical approaches toward the twenty-first-century skills and attitudes in the context of teacher education. In addressing the complexities of learning to teach in a powerful way, it is important to provide empirical evidence of the impact of pedagogical approaches on progression of students' skills that are aimed to be facilitated.

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