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Teacher roles and adoption of educational technology in the Chinese context

Abstract

In the new digital and knowledge society, education is facing great challenges from traditional ways of instruction and learning towards more innovative ways. It also raises a great demand for the transformation of teacher roles from the traditional knowledge transmitter to a new set of roles. This research focuses on perceptions of teacher roles and their impacts on the adoption of educational technology in schools in a Chinese context. Participants in this study are 125 primary and secondary teachers in a Chinese school in Beijing. Five types of teacher roles (expert, authority, model, facilitator and delegator) are reflected. The results show that teachers of facilitator/ expert profile and facilitator/delegator profile are more inclined to adopt educational technology. The current development of ICT use in teaching and learning as well as challenges faced in the Chinese educational context are presented.

Keywords

Rollen von Lehrkräften und Nutzung von Bildungstechnologien in China

Zusammenfassung

In der neuen Wissens- und Digitalen Gesellschaft sind Bildung, Schule und Unterricht mit großen Herausforderungen beim Übergang von traditionellen zu innovativeren Arten des Lehrens und Lernens konfrontiert. Damit ergibt sich auch ein großer Bedarf an einem Wandel der Lehrerrolle, von der Rolle des traditionellen Wissensvermittlers hin zu einer Reihe von neuen Rollen. Die vorliegende Forschungsarbeit untersucht Wahrnehmungen von Lehrerrollen und deren Auswirkungen auf die Nutzung von Bildungstechnologien in Schulen in China. Die Teilnehmer dieser empirischen Studie sind 125 Primar- und Sekundarschullehrerinnen und -lehrer einer chinesischen Schule in Peking. Die Untersuchung unterscheidet fünf Typen von Lehrerrollen: expert, authority, personal model, facilitator und delegator. Die Ergebnisse der vorliegenden Studie zeigen, dass Lehrerinnen und Lehrer mit den Profilen facilitator/expert und facilitator/delegator eher dazu geneigt sind, Bildungstechnologien einzusetzen. Diese

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Ergebnisse werden im Kontext aktueller Entwicklungen zur Nutzung von ICT für das Lehren und Lernen und den Herausforderungen im chinesischen Bildungskontext präsentiert und diskutiert.

Schlagworte

Bildungstechnologie; Rollen von Lehrkräften; Kontext China

1. Introduction

The development of science and technology, especially the application of information and communication technologies (ICT) in the new era has greatly influenced teaching and learning in education. Educational transformation and reform have become an urgent issue across the globe to meet the demands of new educational objectives in the knowledge-based economy (Barone & Hagner, 2001).

In the new digital and knowledge society in the 21st century, education is facing great challenges from traditional ways of learning towards innovative ways of learning. It also raises great demands for the transformation of teacher roles from the traditional knowledge transmitter to a new set of roles such as facilitator and delegator. This transformation requires that teachers can face their new tasks in a more flexible way and be prepared for their new roles.

Educational technology is the practice of using ICT to facilitate learning and improve performance by applying appropriate technological processes and resources (Richey, 2008). Educational technologies bring fundamental changes to the way teaching and learning occur in schools. Effective use of ICT in schools must enable critical role shifts for teachers (Schifter, 2000). This major factor determines the prospect of the impact of educational technology on school change. In order to innovate education, besides greater access, connectivity, new curriculum packages and online tools, it is also very important to support and cultivate new roles for teachers in the context of a whole-school change process (Clark, 2001).

Since the use of ICT in education, there has been an ongoing debate as to the different roles of teachers (Haaksma-Oostijen & Puper, 2003; Riel, 2000; Semenov, 2000). In fact, new educational technologies do not curb the previous roles of teachers, but they call for a redefinition or additional roles of teachers. The role of teachers has changed and continues to change from being an instructor to becoming a constructor, facilitator, coach, and creator of learning environments. Today teachers are required to be facilitators helping learners to make judgements about the quality and validity of new sources and knowledge, be open-minded and critical independent professionals, be active cooperators, collaborators, and mediators between learners and what they need to know, and providers to scaffold understanding (Weinberger, Fischer, & Mandl, 2002).

This change requires new competencies of teachers. For teachers to be able to integrate the use of ICT into teaching, a vast array of competencies need to be developed, such as: creativity, flexibility, logistic skills for assigning work and study

places as well as grouping students, skills for project work, administrative and organizational skills, collaborating skills, and computer competence. In assuming their new roles, teachers are expected to upgrade their knowledge and acquire new skills, including new pedagogical skills and ICT competence to fully integrate educational technology into the curriculum (Zepp, 2005).

1.1 Teacher roles

Teachers are regarded as the most influential factor in educational innovations (Fishman & Davis, 2006). The organizational use of technology changes roles and relationships, uses of time and resources, and the availability of support for teachers and students. The new technologies are accelerating fundamental changes in the teacher's role as well as in the shape and in the activities in the classroom.

Teacher roles are influenced by a particular pattern of needs, as well as mental, spiritual and physical behaviors that teachers display in the classroom (Eble, 1976). The research of Grasha (1994) summarizes several patterns that describe the role differences of teachers: expert, formal authority, personal model, facilitator and delegator. Teachers adopting the role of *expert* perceive that it is essential that the teacher should have abundant knowledge about the domain they teach and should play a role of knowledge source for the students. Teachers adopting the role of *authority* perceive that the teacher should be very knowledgeable about the subject they teach and most importantly they assume themselves to be authoritarian in this knowledge domain and students should follow the standards the teachers set for them. The role of *model* means that what the teacher says, does or demonstrates in class serves as a model for students to follow and learn from, and teachers adopting this role perceive their behavior to be influential to student development. Teachers adopting the role of *facilitator* regard it as more important for teachers to guide students to learn new things based on what they already know and facilitate the *learning* processes for students. Teachers adopting the *delegator* role will more often give assignments to students and encourage them to work independently or in a self-directed manner. Grasha (1994) gives the following examples to describe these different roles:

- Expert: "Facts, concepts, and principles are the most important things that students can acquire."
- Formal authority: "I set high standards in this class."
- Personal model: "What I say and do models appropriate ways for students to think about content issues."
- Facilitator: "Small group discussions are employed to help students develop their ability to think critically."
- Delegator: "Students in this course engage in self-initiated, self-directed learning experiences."

The adoption of specific teacher roles in the instructional process may facilitate or hinder students' ability to acquire content and skills (Zhu, Valcke, & Schellens, 2010). Previous research has argued that teachers adopting the social constructivist approach would adapt to the role of a facilitator or delegator, and would less likely play the role of an authority, an expert or a model (Bauersfeld, 1995; Compeau, Higgins, & Huff, 1999). This particular shift in roles implies that a facilitator or a delegator needs to display a different set of skills than an information or knowledge transmitter (Brownstein, 2001). It has to be noted that almost every teacher adopts each of the five teaching roles to varying degrees. In different cultural contexts, teacher roles are viewed differently with an emphasis on some of these roles or other additional roles (e.g. Cortazzi, 1990).

1.2 The adoption of educational technology

Educational technology has the potential to improve teaching practices in education; however, the integrated use of technology in education is a complex system. In the last decade, educational technology has made only modest inroads into changing teaching in schools and universities (Moser, 2007). What are mechanisms that support or hamper teacher behavior regarding the adoption of educational technology? Studies have indicated that numerous barriers against teachers adopting educational technology exist (Cuban, 2001; Ebersole & Vorndam, 2003; Reeves, 2003). Past studies have indicated that both internal and external factors influence teacher's adoption of technology in classrooms (Krischner, 2001; Rogers, 2003). Recent research has paid more and more attention to the perception of teacher roles (Adams, 2003; Ebersole & Vorndam, 2003). Robertson (2004) points out that the adoption of instructional strategies is closely related to teachers' perceptions of their roles and perspectives about teaching and learning. Recent studies have incorporated additional factors, such as the role of educational beliefs (Ertmer, 2005; Tondeur, Valcke, & van Braak, 2008) and how teachers perform their role (Postholm, 2006). Previous studies have pointed out that in order to give full play to educational technology, it is expected that teachers need to adapt their roles and provide more support, guidance and scaffolding to students (e.g. Bransford, Brown, & Cocking, 1999). Therefore, this study focuses on teacher profiles, namely their perceptions of teacher roles and the relationship to the adoption of educational technology in schools.

1.3 The Chinese educational context

Cultural contexts need to be considered as an important element in the implementation of ICT (Albirini, 2006) and culture may play an important role influencing how teachers relate their beliefs to ICT use (Chai, Hong, & Teo, 2009). Cultural differences have been identified when comparing Chinese and European teach-

er perspectives on the use of ICT in teaching and learning (Zhu et al., 2010). The findings indicate that Chinese teachers express more doubts about the constructivist principles underlying many ICT applications (e.g., collaboration, independent learning and self-directed learning). Previous studies also identified that there is a bigger power distance between teachers and students in the Chinese context compared to Western contexts (Hofstede, 1986). Chinese teachers perceived themselves more of an authority role compared to Western teachers (Zhu et al., 2010). The authority figure of Chinese teachers has an impact on the teachers' use of educational technology. On the one hand, teachers use educational technology mostly to deliver factual knowledge as they most often do in classrooms; on the other hand, the interactive use of educational technologies is rather limited as this may not be in line with the formal authority role of teachers. Teachers regarding authority as an important role would consider a dialogic or student centered approach as heresy and evidence of an incompetent teacher (Brooks, 1997, p. 14). Instead, respect for teachers and teacher authority is considered an important basis for classroom discipline and control of student behavior (Ho, 2001). Teacher-centered pedagogy and student compliance are prevalent in the Chinese classroom (Biggs, 1996). And recent research points out that student-centered learning clashes with more traditional norms and incentives of many Chinese teachers (Fang & Warschauer, 2004).

Chinese students are highly examination-oriented (Ballard & Clanchy, 1991). This is closely related to the highly selective educational system. Entrance examinations, especially the National University Entrance Examination, have a large influence on Chinese education. This means that primary school students have to face a competitive examination in order to get enrolled at their desired secondary schools; and the secondary school students have to face a very harsh national university entrance examination in order to access universities. Under the pressure of the selective educational system, schools and universities are forced to use teaching and learning methods that are very examination-oriented, as the exam scores are important evaluation criteria for the students' further studies or careers. For this aim, many Chinese teachers stress systematic knowledge transmission, thus teacher-centered approaches still prevail in Chinese schools and universities.

During the last decade, huge investments have been made in ICT infrastructure at schools and universities in China; therefore the hardware and network is quite advanced in many of the schools and universities (Ma, 2005). Considering the level of student computer competence, and the time they spend on the internet, technical skills of Chinese students in urban areas are not less advanced than Western students' skills (Chen, 2006). However, the integrated use of ICT in teaching is facing challenges (Gerbic, 2005). In some experimental schools, special computerized classes are set up with "one child one PC" and teachers using computer as the main media for education. However, in regular classes, the integrated use of computer in teaching and learning is limited.

1.4 Research objectives

Based on the theoretical and conceptual background presented above, the present research centers on the following two research questions:
1. How do Chinese teachers perceive their teacher roles?
2. Is there a relationship between teacher profiles (perceptions of teacher roles) and their adoption of educational technology?

2. Methods

2.1 Research setting

The development of educational technology has become one of the important elements in the modernization of Chinese education. During the last 20 years, the Chinese government has initiated a large-scale investment in ICT in the school system. From 2000 on, the Chinese government has promulgated policy guidelines to encourage teachers to apply ICT and integrate educational technology into their teaching processes. However, the development of ICT in education faces great challenges. In some schools, the hardware infrastructure is quite advanced, however the level of use is quite limited. Many factors (both internal and external) are related to the adoption of educational technology in the classrooms (Gamoran, Secada, & Marrett, 2000; van Braak, 2001). The present study only focuses on one of the important internal factors – teachers' perceptions of their roles.

2.2 Participants

A case study was conducted in 2009 to address the above research questions. Participants in the study consisted of 125 teachers from a Chinese comprehensive school (primary and secondary) in Beijing. The questionnaires were delivered by paper to 175 teachers. The response rate was 72%. Teachers of five different subjects (Chinese language, mathematics, English language, science including chemistry, physics and biology, as well as politics) were randomly selected. However, an attempt was made to select a representative sample in terms of gender and age. The composition of teachers is shown in Table 1.

Table 1:   Chinese teacher participants in this study

Age group	Male	Female	Total
20–30	15	15	30
31–40	16	15	31
41–50	17	16	33
Over 50	16	15	31
Total	64	61	125

2.3 Instruments

Teacher roles. The Teacher Role Survey was administered based on the instrument developed by Grasha and Riechmann-Hruska (1990) reflecting five scales that centre on specific teacher roles: expert, formal authority, personal model, facilitator and delegator. When filling out the instruments, teachers were asked to reply to the items by reflecting on their experiences with a particular teaching course. A questionnaire with 40 items required respondents to indicate on a five-point scale to which extent they agree/disagree with this item. The questionnaire was translated from the original English version into Chinese. Back-translation techniques were applied to ensure the quality of the translation. Furthermore, the Chinese version was first tested with 15 participants to ensure the comprehensibility of the questions by Chinese respondents. The internal consistency for the five factors was good or acceptable (Cronbachs α ranges between .74 and .83).

   Willingness to adopt educational technology. Teacher willingness to adopt educational technology was measured with five scales (willingness to invest time, willingness to learn, willingness to use ICT for teaching in the classroom, willingness to adopt online instruction and learning, willingness to use ICT for preparation of lessons and assessment of students). This questionnaire was self-developed and was composed of 20 questions. It was tested with a pilot study with 15 participants. Questions are on a five-point scale and the internal consistency of each scale was sufficiently acceptable (α between .75 and .85).

   Next to the questionnaires, interviews with focus-groups (6 teachers per group) interviews were conducted with a random selection of 60 teachers. Each interview took about 45 to 60 minutes. Teachers were interviewed with semi-structured questions about their perceptions of teacher roles, perceptions on education innovation and adoption of educational technologies. All interviews were recorded and the transcripts were coded for analysis.

3. Results

The mean scores of Chinese teachers' perceptions of the five teacher roles are presented in Table 2. In general, most of the Chinese teachers seemed to be more in favor of the teacher as expert, authority and model compared to the roles as facilitator and delegator. Some differences were detected between teachers of different age groups. MANOVA tests showed that the younger group of teachers (20–30 year-olds) were less likely to adopt the role of *expert* and *authority* than other age groups ($p < .05$). The elder group (over 50 year-olds) of teachers was less likely to adopt the role of *facilitator* and *delegator* compared to the younger groups of teachers ($p < .05$). T-test results show that there were no significant differences between female and male teachers in their perceptions of teacher roles ($p > .05$).

Table 2: Perception of teacher roles in a Chinese school setting

Teacher roles	Gender		Age group				
	Male M (SD)	Female M (SD)	20–30 M (SD)	31–40 M (SD)	41–50 M (SD)	Over 50 M (SD)	Total M (SD)
Expert	4.12 (.65)	4.05 (.47)	3.51 (.61)	4.05 (.51)	4.10 (.68)	4.22 (.39)	4.06 (.42)
Authority	4.13 (.59)	3.74 (.52)	3.48 (.50)	3.90 (.63)	4.03 (.45)	4.19 (.69)	3.93 (.47)
Model	4.01 (.58)	3.92 (.63)	3.88 (.61)	4.02 (.52)	4.05 (.53)	4.10 (.51)	3.99 (.55)
Facilitator	3.75 (.50)	4.01 (.70)	4.12 (.51)	4.00 (.49)	3.76 (.48)	3.30 (.63)	3.82 (.51)
Delegator	3.65 (.61)	4.94 (.59)	4.07 (.70)	4.01 (.60)	3.70 (.59)	3.23 (.50)	3.79 (.54)

Cluster analyses were conducted to understand teacher profiles based on their dominant perceptions of teacher roles. The results show that 35% of the teachers preferred the expert/authority profile; 24% of them belonged to the expert/authority/model profile; about 18% of the teachers supported the facilitator/delegator profile, and 23% of the teachers supported both the facilitator and expert roles.

Table 3: Teacher profiles and their adoption of educational technology

Teacher profiles and characteristics	Willingness to invest time	Willingness to learn	Willingness to use ICT for teaching in the classroom	Willingness to adopt online instruction and learning	Willingness to use ICT for preparation of lessons and assessment of students
Expert/Authority (35%)		*			
Expert/Authority/Model (24%)		*			
Facilitator/Expert (23%)	**	**	*	*	*
Facilitator/Delegator (18%)	**	**	**	*	*

* $p < .05$. ** $p < .01$.

No significant relationship was identified between the expert/authority and expert/authority/model profile teachers and their willingness to adopt educational technology, except in the scale of "willingness to learn". The expert/authority style is normally more in line with the 'traditional' teaching style and it sends a message to students that "I'm in charge here" and tends to create a "cool" emotional climate and some "distance" between teacher and student. In contrast, a positive relationship was found between the facilitator/expert and facilitator/delegator profile teachers and their willingness to adopt educational technology. These teachers are more likely to send a message to students saying, "I'm here to support you and to act as a resource person." A warmer emotional climate is created and students and teachers can work together, share information, and the boundaries between teacher and student are not as formal as the first two clusters as presented in Table 3.

The interview results were coded and analyzed. Next to the triangulation of results found in the quantitative data, additional results were derived. The interview results confirmed that the authority and expert roles are important roles for Chinese teachers. According to many of them, "a teacher needs to be an authority in the knowledge domain", and "a teacher needs to be knowledgeable in his/her teaching subject". As to the facilitator and delegator roles, a large number of Chinese teachers support the notion that a teacher should facilitate the learning processes of students. Next to the facilitator role, many Chinese teachers also refer to their role as a "guide", who gives guidance and offers help to students during their learning processes. Many teachers said that they often adopt different roles based on the teaching subjects and the knowledge level of students. The model role is also regarded to be important, as most Chinese teachers believe that they should play an important role in students' personal development. As to the willingness to adopt educational technology, most teachers expressed their willingness to learn. However, there seemed to be no significant relations between teachers who were in favor of the expert and authority roles and their willingness to adopt ICT in the classroom and online instruction and learning. On the contrary, the teachers who were in favor of facilitator and delegator roles were more inclined to adopt educational technology.

4. Discussion

4.1 Teacher roles and adoption of educational technology

The results of this study show that the majority of Chinese teachers regard "expert", "authority" and "model" as important roles. This is in line with previous claims that Chinese teachers are regarded as a model both of knowledge and morality (Jin & Cortazzi, 1998). The research of Paine (1990), Brick (1991), as well as Cortazzi and Jin (1996) indicates that the authoritative role of teachers is clearly emphasized in the Chinese context. The present results confirm that the author-

ity figure of teachers is still important in the Chinese context as reported in previous research.

Our results indicate that there are no significant differences between female and male teachers in their perceptions of teacher roles. In fact, many teachers point out that they adopt different roles, depending on the teaching objectives, student background, etc. Nevertheless, each role demands that teachers have or are willing to acquire the skills to adopt related instructional strategies. In the interviews, quite some teachers consider the transmission of knowledge to be (still) very important, and thus it is the teacher's job to 'provide' and 'transmit' theories and basic knowledge to them. The younger teachers seemed to be more inclined to adopt the facilitator and delegator roles compared to the elder teachers.

The results show that teachers with a profile of facilitator/expert and facilitator/delegator are more willing to adopt educational technology. This is in line with previous claims that in the new learning environment, a new set of teacher roles is needed, such as facilitator and delegator (Bauersfeld, 1995; Brownstein, 2001). Social constructivism thus emphasizes the importance of the learner being actively involved in the learning process, unlike previous educational viewpoints where the responsibility rested with the instructor to teach and where the learner played a passive and receptive role.

Recent research has indicated that teachers' educational beliefs are closely linked to their actual use of ICT in classrooms and adoption of educational technology (Dwyer, Ringstaff, & Sandholtz, 1991; Tondeur et al., 2008). This study has proven from a new perspective that teachers' perceptions are an important aspect that influences their adoption of ICT in teaching and learning. Therefore, the findings from the Chinese context, at least from this study, are in line with other studies conducted in Western contexts.

Teachers are expected to know a great deal about individual learning processes and to have the skills to coach these processes, as well as subject knowledge (Volman, 2005). Electronic learning environments are rational systems which take a lot of work off teachers' shoulders. However, the role of teachers will become more complex rather than simpler. Teachers must know what programs are available that are suitable for their students' individual needs and keep abreast of this. They need to be the arrangers or planners of students' learning processes: they bring together the educational tools and set them up in a particular way.

Huge demands are made on teachers' abilities in fulfilling their different roles as instructors, consultants, trainers, coaches, advisors, navigators, and assessors. Teachers have more freedom and flexibility in their work on the one hand, yet on the other, the necessity of keeping the information in the student monitoring system up to date adds an administrative element to their work. This requires a more structural approach which in turn limits their freedom, preparing not only lessons but projects. This makes planning and coordination skills important. In addition, teachers need to be adept at prompting and holding discussions with students about meaningful questions.

4.2 Challenges for teachers

Educational technology can provide many advantages for instructional and learning innovations. However, educational transformation also sets up new requirements to teachers as to their teaching and learning concepts and the roles of teachers. In the new scenario, teachers cannot just stick to the traditional transmitting methods of teaching; instead teachers will play new roles as guides or facilitators for students. This way, students' interests can be better stimulated, and students can take more initiatives to learn more actively and develop their independent thinking and abilities to do things and solve problems themselves. Therefore, teachers need to adapt their beliefs about teaching and learning, and be prepared for the new roles that are deemed helpful in promoting student learning when using educational technologies. Secondly, teachers need to be willing to invest time and willing to learn, for example to improve their digital literacy in order to tackle the technology issues properly to support teaching and learning. Only this way they can take full advantage of educational technology, the interactive and communication technologies to connect and interact with their students and the outside world in a constructive way.

Are in-service teachers and potential teachers in today's teacher training programs being well-prepared in how technology relates to educational philosophy? Teachers need the access, training, ongoing support and time to become proficient, productive users of technology. This is crucial in order for teachers to fulfill their roles as facilitators of learning. Nuyen (1995) describes concisely that the role of education is not to pass on the truth but to edify; what we need is not a battery of computer terminals, but a whole range of teachers who, not only convey truth, but who excite students' imagination.

4.3 Other challenges for innovation in education

For quite a long time, education in China has been influenced by behaviorist-approaches (Xu, 2004). In the last decade, reform and curriculum transformation have taken place to promote more student active, participatory approaches. However, at many schools and universities, the boundaries between old and new teaching approaches are ambiguous and intertwined, and in some cases no sustainable model is available. For example, traditional learning content is sometimes 'shoveled' on to the Web (a static version as in books or print-outs). Although computer and Internet technologies are used, they closely model instructor-led teaching, focusing mostly on broadcast video-based lectures or synchronous classes on the Web. This is not sustainable and cannot improve student performance and learning outcomes. Secondly, although new concepts of teaching and learning have been promoted and transformed the teaching practices of some teachers, there are quite some teachers still sticking to the traditional "transmitting" mode. Main

obstacles for the development of educational technology are teachers' concepts of teaching and learning. Therefore, there is an urgent need to transform teachers' conception of teaching in the Chinese context. Thirdly, it is important to nurture a new environment that supports the change of educational structure, form a new type of teaching and learning mode, and meet the demands of education objectives in the new era. More importantly, the traditional norms about the role of teachers and the selective educational system in China have great impacts on the adoption of educational technology in teaching and learning.

In addition, although many schools and higher education institutions have invested a lot in hardware, the educational technology application in teaching and learning is still quite limited. In many schools and universities, the use of ICT in teaching and learning is only applied for "demonstration courses" or "elite courses". Furthermore, although huge progress has been made in ICT infrastructure construction, there still is a lack of funding for developing e-resources, online instructional content and teacher training, etc.

As the Chinese government put forth, invigorating the country through science and education, and education should come first in order to prepare the younger generation for creative thinking and innovation for the future. "Building a life-long learning society" has also become a new objective in the Education Action Plan by the Ministry of Education (cf. Ministry of Education of The People's Republic of China, http://www.moe.edu.cn). In order to build schools and universities as learning organizations in the new century, some fundamental changes are needed. The issues raised in this study tackled some of the critical areas where fundamental changes are necessary.

5. Conclusion

This study focused on examining Chinese teacher roles, and their relationship to teacher adoption of educational technology in schools. A case study of a Chinese school in Beijing was made and empirical data was analyzed to understand teachers' perceptions of their roles, and their willingness to adopt educational technology. The study gives insights into the current status of educational technology adoption in the Chinese context and the factors influencing the adoption of educational technology. In order to face the challenges of educational change in the new era, the two critical factors – teacher roles and teacher computer competency – should be attended to. Schools and universities should aim at building themselves as learning organizations to meet the demands of education in the new knowledge economy.

Teaching in the knowledge society requires a new form of teaching concept and teacher roles. This will all require new forms of educational professionalism, tapping well beyond traditional teachers, and blending together with the communities that schools serve. The future that teachers and students co-create can provide the

emerging knowledge/innovation a boost, greatly enhancing human capital and potentials, and the role of schools as learning communities in general.

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