Matrix Of Professional Competencies As A Framework For Initial Teacher Education Program

Mohsen Hosseini Bidokht, Ezatolah Naderi, Ali Shariatmadari

The purpose of this study is to introduce a matrix of professional knowledge and responsibilities (MPK&R) for initial teacher education programs. The MPK&R framework articulated the desired professional knowledge and professional responsibilities for beginning teacher. The paper has two parts, the first of which details the development as well as the conceptual underlyng of the MPK&R framework. Part two, through a program evaluation, discuss the validity and reliability of item developed through the MPK&R framework to measure the knowledge and professional responsibilities that teachers perceived through their initial teacher preparation program. The data was analyzed using the SPSS. A correlation matrix was computed for the 6 and 4 items under each construct (teacher’s knowledge and responsibilities) to examine whether the cluster of variables correlates to each other. The matrix of correlation coefficient and their respective significance level for the 6 items designed to measure student to measures teachers’ knowledge and 4 items designed to measures teacher’s professional responsibilities shown in table 1 and 2. The values of correlation coefficient range from moderate 0.226 to high 0.718 and all the correlation coefficient are significant at the 0.05 level.

INTRODUCTION

All children no matter where they live or who they are – deserved qualified teachers. Because of public demand, professional knowledge of teacher has become a focus of interest to educators and policy makers and attracting the scholars and researcher [20,17] Although there are serious challenges and disagreement about what qualification makes an effective teacher, challenges about problems abound, there is not an agreement about the kind of knowledge which makes a teacher as an effective practitioner. There is lot of haze in the literature review of teacher’s professional knowledge; how is teacher knowledge defined? What research method and model of inquiry are adopted by the researchers and related people? What are conceived as the implication of teacher’s professional knowledge and how can we assess it? Continuous rapid development in society and education, both legally and globally, have proposed lots of challenges about the characteristics of effective and qualified teacher and qualified teacher education program. It is impossible to shred the complexity of a program that makes a teacher an effective and responsible practitioner. But designing a comprehensive framework can be guideline which helps teacher educators and prospective teachers. Issues about Subject or content knowledge, pedagogical preparation, social and philosophical awareness, clinical training, policy influences, alternative certification which offered by district and state, all are problems that make teacher education program as a complicated situation. On the other hand, all of these consideration and preparation makes no warranty for success of the teachers. Program design and teacher preparation in spite of their common interests and aims, vary widely across the world. They try to train competent, self regulated teacher who are aware of their responsibilities. So the paper has two parts. The first details the development as well as the conceptual underpinning of MPK&R framework. Part two through a program evaluation looks at the validity and reliability of items developed through the MPK&R framework to measures the teacher’s professional knowledge and responsibilities that prospective teachers perceived through their initial teacher preparation program.
Development of the MPK&R framework:

Competency framework attempts to make explicit a set of minimum and essential desired attributes of beginning teachers the framework can be used by teacher education curriculum developers, policy makers and teacher educators and even the prospective teachers themselves. In developing the framework the following approaches were adopted. “Research based” approach. Carefully review of the recent literature on best practices and progressive models in teacher preparation and learning was conducted. This process provided challenges, issues and concerns in teacher education, such as technological pedagogical content knowledge, philosophical and psychological knowledge of education. “Expert consensus” approach. Carefully selected groups of experienced policy makers and professionals in teacher education were consulted to finalize the knowledge domain and professional responsibilities as a proposed matrix. Then the matrix was consulted with the main stakeholders like principals, ministry of education, faculty, student teacher and graduated teachers. This matrix consists of six knowledge domain and four professional responsibilities for teachers.

Matrix of professional knowledge and responsibilities (MPK&R)

<table>
<thead>
<tr>
<th>Competencies / Responsibilities</th>
<th>Content Knowledge</th>
<th>Pedagogical Knowledge</th>
<th>Pedagogical Content Knowledge</th>
<th>Technological Pedagogical Content Knowledge</th>
<th>Psychological Knowledge</th>
<th>Philosophical Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Researcher teacher</strong></td>
<td>Content knowledge</td>
<td>Pedagogical knowledge</td>
<td>Pedagogical content knowledge</td>
<td>Technological pedagogical content knowledge</td>
<td>Psychological knowledge</td>
<td>Philosophical knowledge</td>
</tr>
<tr>
<td><strong>Reflective practitioner</strong></td>
<td>Content knowledge</td>
<td>Pedagogical knowledge</td>
<td>Pedagogical content knowledge</td>
<td>Technological pedagogical content knowledge</td>
<td>Psychological knowledge</td>
<td>Philosophical knowledge</td>
</tr>
<tr>
<td><strong>Professional participation</strong></td>
<td>Content knowledge</td>
<td>Pedagogical knowledge</td>
<td>Pedagogical content knowledge</td>
<td>Technological pedagogical content knowledge</td>
<td>Psychological knowledge</td>
<td>Philosophical knowledge</td>
</tr>
<tr>
<td><strong>Self assessment</strong></td>
<td>Content knowledge</td>
<td>Pedagogical knowledge</td>
<td>Pedagogical content knowledge</td>
<td>Technological pedagogical content knowledge</td>
<td>Psychological knowledge</td>
<td>Philosophical knowledge</td>
</tr>
</tbody>
</table>

**Literature Review for the (MPK&R) framework:**

**Teacher’s professional knowledge:**

**Content Knowledge:**

is knowledge about the actual subject matter that is to be learned or taught. The content to be covered in high school social studies or algebra is very different from the content to be covered in a graduate course on computer science or art history. Clearly, teachers must know and understand the subjects they teach, including: knowledge of central facts, concepts, theories and procedures within a given field; knowledge of explanatory frameworks that organize and connect ideas; and knowledge of the rules of evidence and proof [20]. Teachers must also understand the nature of knowledge and inquiry in different fields. For example, how is a proof in mathematics different from a historical explanation or a literary interpretation? Teachers who do not have these understandings can misrepresent those subjects to their students [3]. Teachers need to understand subject matter deeply and flexibly so they can help students create useful cognitive maps, relate one idea to another, and address misconceptions. Teachers need to see how ideas connect across fields and to everyday life. They must know which concepts and skills are central to accomplish and which are peripheral. Teacher should be aware of their current challenges in content knowledge.

This kind of understanding provides a foundation for pedagogical content knowledge that enables teachers to make ideas accessible to others [19].

**Pedagogical Knowledge:**

is deep knowledge about the processes and practices or methods of teaching and learning and how it encompasses (among other things) overall educational purposes, values and aims. This is a generic form of knowledge that is involved in all issues of student learning, classroom management, lesson plan development and implementation, and student evaluation. It includes knowledge about techniques or methods to be used in the classroom; the nature of the target audience; and strategies for evaluating student understanding. Teachers with deep pedagogical knowledge understand how students construct knowledge and acquire skills; develop habits of mind and positive dispositions towards learning. As such, pedagogical knowledge requires an
understanding of cognitive, social and developmental theories of learning and how they apply to students in their classroom. [11].

![Diagram](image)

**Fig. 1: MPK&R model for teacher education**

**Pedagogical content knowledge:**

Shulman [20] advanced thinking about teacher knowledge by introducing this new idea. He claimed that the emphases on teachers’ subject knowledge and pedagogy were being treated as mutually exclusive domains in research concerned with these domains [21]. The practical consequence of such exclusion was production of teacher education programs in which a focus on either subject matter or pedagogy dominated. To address this dichotomy, he proposed to consider the necessary relationship between the two by introducing the notion of PCK. This knowledge includes knowing what teaching approaches fit the content, and likewise, knowing how elements of the content can be arranged for better teaching. This knowledge is different from the knowledge of a disciplinary expert and also from the general pedagogical knowledge shared by teachers across disciplines. PCK is concerned with the representation and formulation of concepts, pedagogical techniques, knowledge of what makes concepts difficult or easy to learn, knowledge of students’ prior knowledge and theories of epistemology. It also involves knowledge of teaching strategies that incorporate appropriate conceptual representations, to address learner difficulties and misconceptions and foster meaningful understanding. It also includes knowledge of what the students bring to the learning situation, knowledge that might be either facilitative or dysfunctional for the particular learning task at hand. This knowledge of students includes their strategies, prior conceptions (both “naïve” and instructionally produced); misconceptions students are likely to have about a particular domain and potential misapplications of prior knowledge.
PCK exists at the intersection of content and pedagogy. Thus it does not refer to a simple consideration of both content and pedagogy, together but in isolation; but rather to an amalgam of content and pedagogy thus enabling transformation of content into pedagogically powerful forms. PCK represents the blending of content and pedagogy into an understanding of how particular aspects of subject matter are organized, adapted, and represented for instruction. Shulman argued that having knowledge of subject matter and general pedagogical strategies, though necessary, were not sufficient for capturing the knowledge of good teachers. To characterize the complex ways in which teachers think about how particular content should be taught, he argued for “pedagogical content knowledge” as the content knowledge that deals with the teaching process, including the “ways of representing and formulating the subject that make it comprehensible to others” (p. 9). If teachers were to be successful they would have to confront both issues (of content and pedagogy) simultaneously, by embodying “the aspects of content most germane to its teachability” [21]. At the heart of PCK is the manner in which subject matter is transformed for teaching. This occurs when the teacher interprets the subject matter, finding different ways to represent it and make it accessible to learners.

Our emphasis on PCK is consistent with the work of many other scholars and recent educational reform documents. Since its introduction in 1987, PCK has become a widely useful and used notion. For instance in the area of science education scholars such as Anderson and Mitchner [2], Hewson and Hewson [10], Cochran, King, and DeRuieter [5]; and professional organizations such as the National Science Teachers Association and National Council for the Accreditation of Teacher Education Schmidt, D.A., Baran, E., Thompson, D., Mishra, P., Koehler, M.j., & Shin, T.S. [17] have all emphasized the value of PCK for teacher preparation and teacher professional development. An analysis of “Teacher Educator’s handbook: Building a knowledge base for the preparation of teachers” shows Shulman as the fourth most cited author of the close to 1500 authors in the book’s author index with an overwhelming majority of those references made to this concept of PCK. It is valued as an epistemological concept that usefully blends together the traditionally separated knowledge bases of content and pedagogy.

Technological pedagogical content knowledge:

is knowledge about the manner in which Technology Knowledge (TK) and content knowledge (CK) and pedagogical knowledge (PK) are reciprocally related to each other. Because of the importance of information technology in every aspect of our life, education systems felt integration of technology with their construction, so lots of researchers and policymakers inclined to investigate the neglected aspect of information technology in pedagogical measures. [14] So, technological pedagogical content knowledge (TPCK) framework [14] has emerged as a representation of knowledge required to use technology in an educational setting in ways that are contextually authentic and pedagogically appropriate. [1] presentation of TPCK in its current form, was developed through a series of design experiments. The TPCK framework acronym was renamed TPACK (pronounced “tee-pack”) for the purpose of making it easier to remember and to form a more integrated whole for three kinds of knowledge addressed: technology, pedagogy and content knowledge [17]. TPACK framework builds on Schulman’s construct of pedagogical content knowledge (PCK) to include technology knowledge as situated within content and pedagogical knowledge. Although technology constrains the kinds of representations possible, newer technologies often afford newer and more varied representations and greater flexibility in navigating across these representations. Teachers need to know not just the subject matter they teach, but also the manner in which the subject matter can be changed by the application of technology. [23]

Philosophical and psychological knowledge:

in reviewing the literature of the related research, Schmidt and el at [17], considered all the presented knowledge in a context. Although, they didn’t isolate philosophical and psychological knowledge, but they believe that education occurs in a context related to the society, values and ideology. When teachers value student’s cultural knowledge, they look for competence rather than deficits and adopt their instructional practice to make them more culturally congruent. Teachers should be aware of the interrelated roles of education and societies. They have to know deep understanding about educational implications of philosophical school of taught, educational theory, ideologies. Articulation of a coherent philosophy based upon thoughtful consideration of educational theory and the role of education in democratic and pluralistic society. [12]

Teachers’ professional responsibilities:
Teacher Researcher:

Teachers for being teachers should be scholars. Even after the most effective initial education program, teachers need to be scholars. If they were not scholars, they could not be effective and competent teachers. Traditionally there has been a disturbing distinction between the wisdom of school based teachers and the wisdom of university based researchers. Generally teachers wisdom been regarded as practical, action–oriented with constant competencies that makes a teacher for ever. Because of constant changes in every field of science, teacher needs to be scholars. They need to be scholars and researcher in content knowledge, pedagogy and
pedagogical content knowledge. They should research in technological pedagogical content knowledge and philosophical and psychological knowledge. [7]

**Reflective practitioners:**

Reflection-in-action is defined by Schön as the ability of professionals to ‘think what they are doing while they are doing it’. He regards this as a key skill. He asserts that the only way to manage the ‘indeterminate zones of (professional) practice’ is through the ability to think on your feet, and apply previous experience to new situations. This is essential work of the professional, and requires the capability of reflection-in-action. Schön was writing before the evidence based medicine revolution but, reading him again ‘post-EBM’, his words make a lot of sense to me, as I strive to be patient-centred, compassionate, evidence-based, and cost effective all at the same time! Schön also offers his thoughts on how this kind of professional is ‘produced’. He describes a number of key concepts, which are worth summarising:

**Professional participation:**

In third millennium societies, there is no limitation in and border around societies. Teachers should participate in their professional communities. They should have mutual relationship with colleagues, social institutions, parents and experts in their professional knowledge, like content knowledge, Pedagogical content knowledge. Teachers should be receptive to feedback from their professional participation. [7]

**Self assessment:**

Teachers should use self assessment instruments and questionnaire to identify areas for growth and further professional development. They have to consider their strength and weaknesses as a teacher in different competencies needed for effective teaching and interaction. [16] self assessment practice provides teachers and administrators with a comprehensive system for assessing, discussing and refining classroom practice. It synthesizes the insight from reflecting, participating, and research finding on different professional knowledge domain like, content knowledge, pedagogical content knowledge and the other knowledge mentioned here as the professional competencies. [11]

**Part two:**

**Aims of analysis of data:**

The data from this paper is part of a program evaluation study. The main objective of this data analysis was to evaluate the validity and reliability of the item in each of the scales developed to measure the professional knowledge and professional responsibilities the student teachers perceive to have acquired. The items were based on the MPK&R framework. The analysis seeks to answer the following:

1.- Do all items in each of the scale measures the same construct that they were meant to measures namely, professional knowledge and responsibilities pertaining to initial teacher education?
2.- Are the derived scales from the above analyses of the items as a whole reliable?

**Methodology:**

The sample of study comprised 112 teacher educators teaching in teacher education programs and 238 teachers graduated from initial teacher education program in Iran. In the sample 69(26.8%) were female and 254(73.2%) were male.

**Instrumentation:**

The researcher made questionnaire was used to investigate the validity and reliability of the professional competencies and responsibilities proposed in the MPK&R frame work. For the construct of teacher professional competencies five underlying dimensions were selected;

Content knowledge, Pedagogical knowledge, Pedagogical content knowledge, Technological pedagogical content knowledge, philosophical knowledge of education, and Psychological knowledge of education. For the construct of professional responsibilities the following dimensions were selected: teacher researcher, reflective practitioners, professional participation, and self assessment.

**Data collection:**

The survey questionnaire was completed by the student teacher after graduation and teacher educators teaching at the initial teacher education with minimum of 15 years experiences.
Data analysis:
The data was analyzed using the SPSS. A correlation matrix was computed for the 6 and 4 items under each construct (teacher’s knowledge and responsibilities) to examine whether the cluster of variables correlates to each other.

RESULT AND DISCUSSION

The matrix of correlation coefficient and their respective significance level for the 6 items designed to measure student to measures teachers’ knowledge and 4 items designed to measures teacher’s professional responsibilities shown in table 1 and 2. The values of correlation coefficient range from moderate 0.226 to high 0.718 and all the correlation coefficient are significant at the 0.05 level.

Table 1: matrix of correlation coefficient of teacher’s professional knowledge [correlation coefficient are significant ≤0.05 level]

<table>
<thead>
<tr>
<th>Variable (item)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>content knowledge</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pedagogical knowledge</td>
<td></td>
<td>0.226</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>pedagogical content knowledge</td>
<td></td>
<td>0.541</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>technological pedagogical content knowledge</td>
<td></td>
<td>0.496</td>
<td>0.363</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological knowledge of education</td>
<td></td>
<td>0.718</td>
<td>0.467</td>
<td>0.540</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>philosophical knowledge of education</td>
<td></td>
<td>0.470</td>
<td>0.317</td>
<td>0.470</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: matrix of correlation coefficient of teacher’s professional responsibilities [correlation coefficient are significant ≤0.05 level]

<table>
<thead>
<tr>
<th>Variable (item)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>teacher researcher</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>reflective practitioners</td>
<td>0.641</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>self assessment</td>
<td>0.463</td>
<td>0.599</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>professional participation</td>
<td>0.685</td>
<td>0.485</td>
<td>0.389</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Conclusion:
The study reported here has moved from a process of identifying the attributes required to the initial teacher education program to developing a MPK&R framework. This framework not only constructs the parameters of teacher’s working knowledge, it also outlines the professional responsibilities that a teacher has against his profession. Although, this framework may help the related people, but it can not guarantee the success of a graduated teacher. The reality of teaching can be different. Teaching is like an art, which depends on the variable situation. Being a good artist needs a good education, although we know that, a good education doesn’t make a good artist, but it’s necessary. The journey that each beginning teacher takes, though with familiar signpost, is unique because it is constructed differently for specific teaching situation. Literature shows that an adaptive teacher is met cognitive, they continually self assess their performances and modify their assumptions and actions as needed [11]. Successful preparation for prospective teachers with an ever increasing diverse student body represents a pressing challenge for teacher educators. It is impossible for teacher education program to prepare teachers for all situations. It is important that beginning teachers are willing to learn from their experiences in the changing situation. So they should be aware of their knowledge domains and responsibilities they need to acquire. They should see their initial teacher education as the start part of a continuum of professional learning. They have to develop a scholarship attitude toward their challenging situation they may confront. They should feel professional responsibility against their competencies that they learn during their initial preparation courses. In this case they can learn to teach.

REFERENCES


