

The development of a theory-informed Communities of Practice Framework for pharmacy and other professional healthcare education programmes

BANAN ABDULRZAQ MUKHALALATI¹* & ANDREA TAYLOR²

¹College of Pharmacy, Qatar University, Doha, Qatar

²Department of Pharmacy and Pharmacology, University of Bath, Bath, United Kingdom

Abstract

This paper describes the development of a novel Communities of Practice (CoP) theory-informed framework. The CoP framework, developed through a rigorous process of extensive review of the literature and peer review by selected healthcare education scholars, comprises six key components: enablers, challenges, curriculum, teaching strategies, assessment, and outcomes. The CoP framework provides a basic conceptual structure to align CoP learning theory to educational practice, in order to understand the interaction between learning theories and educational practices and to reduce the possible disconnect within this interaction. It can be used as a theoretical instrument to inform the design of new professional healthcare education programmes or to analyse the evidence of CoP application in existing programmes. This is important to reduce the gap between learning theory and educational practices in programme design, and to enhance students' learning experience.

Keywords: *Communities of Practice, Learning Theories, Practical Placements, Preceptors, Professional Healthcare Education*

Introduction

Recent decades have been characterised by a constantly changing healthcare environment, with consequent impact on the pharmacy profession, pharmacist roles, and curriculum restructuring efforts (Austin & Ensom, 2008; Frankel, Louizos & Austin, 2014; Duncan & Gleason, 2015). Many curriculum restructuring efforts have focused on providing students with opportunities to experience the uncertainties of practice through practice placements (Noble *et al.*, 2011).

Waterfield (2011) explained that consideration of the theoretical nature, ideas and beliefs that inform the philosophy of pharmacy education and the profession are key to restructuring efforts in pharmacy education. Unfortunately, a limited number of studies in the pharmacy education literature have focused on the scope of the pharmacy profession and on the ideology and the theoretical nature of curriculum design when discussing pharmacy education restructuring (Duncan-Hewitt & Austin, 2005; Austin & Ensom, 2008; Waterfield, 2011; Husband, Todd & Fulton, 2014). This has exposed a gap between what is taught in pharmacy schools and what happens in real practice.

Communities of Practice (CoP) is a social theory of learning proposed between the late 1980s and early 1990s by Lave & Wenger (1991) and developed further by Wenger (Wenger, 1998; Wenger, McDermott &

Snyder, 2002). CoPs are groups of people who share a concern or passion, defined by knowledge, for something they do, and learn how to do it better as they regularly interact together (Wenger, 1998).

There are three fundamental elements of a CoP: the domain, the practice, and the community (Wenger *et al.*, 2002). The domain is the common passion, shared by all members of the community. The practice is the fundamental tacit and explicit knowledge that the members distribute and expand. The community involves the reciprocal relationships between experts and learners, which leads to participation and learning (Kothari *et al.*, 2015), and which gives the CoP its distinctive identity (Bentley, Browman & Poole, 2010).

Duncan-Hewitt & Austin (2005) were among the early scholars to propose a fundamental restructuring of pharmacy education based on CoP theory. They suggested that the CoP theoretical model in pharmacy education could be implemented by designing an environment where students, residents, practitioners, and faculty members work together and learn from each other. Duncan-Hewitt & Austin's work foregrounded the importance of integrating pharmacy education with practice through CoP.

While the idea of implementing CoP in pharmacy education has not been accepted or adopted widely, Noble *et al.* (2011) proposed that curricular restructuring

*Correspondence: Dr. Banan Abdulrzaq Mukhalalati, Assistant Professor, Clinical Pharmacy and Practice Section, College of Pharmacy, Qatar University, P.O. Box 19920, Doha, Qatar. Tel: +974 55844783. Email: banan.m@qu.edu.qa

in pharmacy education in the direction of CoP would positively affect all members of the pharmacy community (Jungnickel *et al.*, 2009). Waterfield (2011) also suggested the development of pharmacy education more theoretically by considering the school of pharmacy as a community of practice.

In healthcare education and practice, there are limited studies in the literature about CoP establishment, evaluation, and outcomes (Fung-Kee-Fung, Boushey & Morash, 2013; McKellar *et al.*, 2014). Fung-Kee-Fung *et al.* (2013) created a CoP regional platform for large-scale collaboration in order to reduce the gap between CoP conceptualisation and implementation in cancer surgery medical practice. This CoP platform has been used as a theoretical lens to analyse the effectiveness of the collaborative process in the 'Leaders in Indigenous Medical Education' network (Mazel & Ewen, 2015). Holden *et al.* (2015) proposed using this CoP platform to address the barriers and enablers to CoP implementation in 'teaching men's health'.

In this article, the development of the first innovative theoretical CoP-based framework to be used in professional healthcare education is described. The CoP framework developed in this research contains ideas and concepts from CoP learning theory. The CoP framework aims to establish a CoP-based education system, and to develop an alignment between CoP learning theory and educational practices, particularly where student learning is gained from practical placements. The purpose of the CoP framework is to serve as an instrument or lens for:

1. the analysis of the design of existing Doctor of Pharmacy (Pharm.D.) programmes or other programmes in professional healthcare education, in order to understand the interaction between learning theories and educational practices, and to reduce the possible disconnect within this interaction;
2. the design of new Pharm.D. programmes or other programmes in professional healthcare education that align learning theories and educational practices.

The CoP framework was utilised in a comprehensive analysis of the existing Pharm.D. programme at Qatar University (QU), demonstrating its applicability in this setting (Mukhalalati, 2016).

Methods

The development of the theoretical CoP-based framework was based on a thorough review of the literature using the Matrix Method (Garrard, 2013). There are two key elements to this method: the creation of a file infrastructure, and a critical search and review of the literature.

A literature review master folder was electronically created, as a file infrastructure, containing four sub-folders. The first sub-folder was the paper trail folder, which contained records of the search process and

databases used. The second sub-folder was the document folder, which contained the documents used in the review, and stored as PDFs. The third sub-folder was the review matrix folder, which contained a structured abstract of selected articles, represented in a table. The rows of the table represented the selected documents, and the columns represented major information about these documents, such as names of the articles, author(s) and journals, publication years, descriptions of the documents, and summaries of points of interest. The fourth sub-folder was the synthesis folder, which contained synthesised drafts of selected documents categorised according to the different components of the CoP framework that will be presented in the results section.

For this study, the process of critical search and review of the literature involved an extensive literature search about CoP theory in healthcare education, using the following academic databases: MEDLINE (PubMed), the Educational Resources Information Centre (ERIC), SCOPUS, and Web of Science. Keywords utilised in the search were combinations of the following words: community of practice, communities of practice, education, health education, health care education, healthcare education, placement, college, university, higher education, pharmacy.

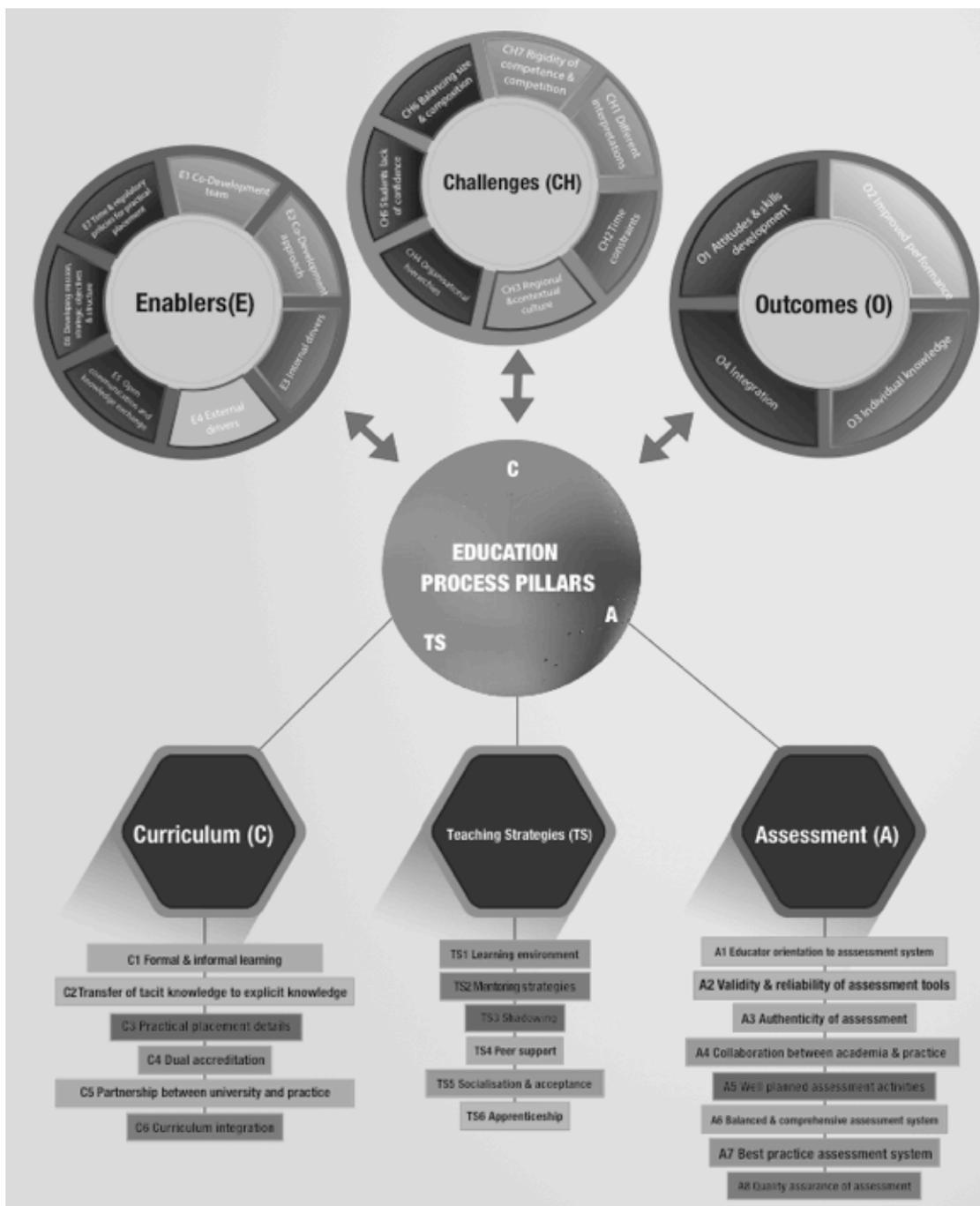
Articles were considered eligible for inclusion in the review if they were within the scope of CoP in healthcare practice and education. Limits to searches were: English language, publication year 1999 and above, and healthcare related publications. To increase the potential for identifying all relevant articles, references cited within selected articles were researched, and their authors were contacted for further relevant literature. Also, notifications were requested from the searched databases about new articles containing utilised keywords, to ensure that the document folder, described above as the second sub-folder, developed by the researchers was updated. In addition, four CoP healthcare education scholars were identified through their scholarly output and by using snowballing technique. These scholars were consulted to determine whether any important references were missed. The CoP framework drew on the work described in 50 articles and five Ph.D. dissertations. Articles were critically appraised based on the purpose of the study, and only those considered sufficiently credible and reliable to merit inclusion were selected to be synthesised into relevant ideas in the CoP framework. A review matrix of these key sources was created to chronologically indicate points of interest for the development of the CoP framework. In developing the framework, the curriculum, teaching strategies, and assessment components were initially selected to form the components of the developed CoP framework, because they represent the education process pillars that need to be conceptualised in detail in a learning paradigm. However, the focus of the literature was primarily on enablers and challenges to the application of CoP theory in an educational programme. The literature also paid attention to the outcomes of the application of

CoP theory. So, enablers, challenges, and outcomes were considered as components of the CoP framework, beside the education process pillars.

Subsequently, six tables were created, reflecting the six components of the framework (enablers, challenges, outcomes, curriculum, teaching strategies, and assessment) in order to facilitate the reading, analysis, and synthesis of the documents. Each important concept in the selected articles was assigned to one of the six tables in the framework, as an element, according to the researcher's own assessment of relevance. The

assignment of the important concepts to the tables was an iterative process involving revision, refinement, and peer review by the research team (including a Director of Taught Post-graduate at University of Bath, and a Professor of Education at QU) through round table discussions and electronic communications. This iterative process aimed to achieve a consensus on the relevance of each important concept (element) to the CoP framework components. Finally, after the framework components were developed, scholars in healthcare education, who were initially contacted during the process of identifying relevant literature, conducted a peer review of the

Figure 1: The CoP Framework



framework, emphasising the relevance, logic, and applicability of the framework as a whole. The developed CoP framework is based on the researcher’s interpretation of the literature as well as experience in the academic field and quality improvement projects. This utilisation of the researcher’s experiences and interpretations of literature is consistent with the approach of Fung-Kee-Fung *et al.* (2013) in developing a regional CoP-based platform for enhancing clinical services.

Results

The developed CoP framework contains six components: enablers, challenges, outcomes, curriculum, teaching strategies, and assessment, as indicated in the Methods section. The terminologies and definitions of those components are listed in Table I.

Table I: Definitions of CoP Framework components

Components	Definition
Influencing Factors	
1. Enablers (E)	Ideal conditions for implementation
2. Challenges (CH)	Factors that hinder implementation
Education process pillars	
3. Curriculum (C)	Content, syllabus, learning outcomes, planned formal and informal learning, and extracurricular and learning activities provided in order to achieve professional competence
4. Teaching strategies (TS)	Strategies that are based on the active engagement of students in their learning (student-centered model) in practice placement, where learning from and in practice is the fundamental aspect in education
5. Assessment (A)	A learning experience that measures learning outcomes, student performance, and progression, and gives the opportunity for constructive feedback
Outcomes	
6. Outcomes (O)	The positive outcomes that result from CoP implementation

The six components of the CoP framework are further sub-divided into elements, which represent the important concepts mentioned in the Methods section, and presented graphically in Figure 1. As illustrated in Figure 1, the researcher assumed that the relationship between the outcomes, challenges, enablers and education process pillars is dynamic and does not reflect a sequential process. For example, a two-way relationship is assumed between enablers and education process pillars, because the successful implementation of the education process

pillars according to a CoP framework does not happen at once, and is influenced by the enablers. Similarly, the existence of enablers happens gradually and is influenced by the closeness between the current practices of education process pillars and their theoretical manifestation in the CoP framework. Furthermore, education process pillars (curriculum, teaching strategies, and assessment) are presented in Figure 1 as a wheel, because they interact with each other in a nonlinear fashion, which means that none of these pillars precedes the others, and that all are equally important to the education process

What follows is a detailed description of the CoP framework components and elements to explain their implementation in an educational system that applies that CoP learning theory.

1. Enablers (E)

There are several enablers that should exist in an educational programme to provide the best conditions and context for the CoP to become an integral part of the programme. The enablers are illustrated in Figure 1.

Table II: Key CoP members in co-development team

CoP member	Responsibility	Example
CoP consultant	Provides guidance about the CoP and answer unique queries regarding the particular context (Roberts, 2006).	Educational scholar
CoP team leader	Makes final decisions about the CoP plans and operations because has administrative authority (Roberts, 2006).	The dean of the college
CoP team coordinator	Participates in meetings and discussions, shares experiences, and is responsible for meeting coordination activities (Roberts, 2006)	Experienced professional
Academic	Ensures that CoP theory is applied within the academic programme and provides feedback about CoP integration (Kerno, 2008)	Faculty liaison
Practice facilitator	Brings real-world perspectives to complement the educational process and exchanges knowledge with academics in areas of assessment, feedback, and curriculum design and delivery (Roberts, 2006).	Clinical preceptor
Sponsor	Liaises between the organisation’s management and the CoP development team to ensure that the CoP objectives are aligned with the organisation’s strategy (Roberts, 2006; Kerno, 2008) and seeks their financial support	Representative from a funding organisation
Champion	Is formally appointed or informally recognised to disseminate knowledge, advocate ideas, build relationships, resolve challenges, facilitate agreement, and convince various stakeholders about the CoP rationale (Kislov <i>et al.</i> , 2011)	Popular figure in healthcare education or practice

E1. Co-development team

A co-development team should be formed to develop a focused CoP implementation plan in academic programmes. The participation of key representatives from all CoP areas ensures a thoughtful planning and implementation process (Fitzsimmons, 2007). Members of the team should understand their responsibility while being treated as a valuable member of the team (Thrysoe *et al.*, 2010). Key CoP members include a consultant, a community coordinator, a leader, an exemplar, academics, a sponsor (Fitzsimmons, 2007), and a champion (Barnett *et al.*, 2014), as described in Table II.

E2. Co-development approach

The co-development approach involves cycles of reflection, planning, benchmarking, execution, and feedback (Fitzsimmons, 2007). These co-development approach cycles are explained in Table III.

The duration and frequency of cycles are affected by the benchmarking processes, the participant's needs expressed in their feedback, and the appropriateness of the planning and execution environment (Fitzsimmons, 2007). The development approach is not static and will not be finished or accomplished. Rather, it is a process that is constantly in flow and evolves over time as specific circumstances change.

Table III: Co-development approach cycles

Cycle	Clarification
Reflection	Involves considering actions that took place, in order to assess them, through reflection in and on action (Kerno, 2008)
Planning	Involves creating strategies and establishing goals, policies, and procedures for the CoP
Benchmarking	Involves comparing participant knowledge about CoPs to real outcomes and learning from others who have gone through the same experience (Kerno, 2008)
Execution	Involves implementation of the CoP by carrying out the plans and courses of action (Mayne <i>et al.</i> , 2015)
Feedback	Involves collecting evaluative information about outcomes in order to modify actions, decisions, and plans in subsequent stages, and to evaluate CoP outcomes and challenges (Austin & Duncan-Hewitt, 2005)

E3. Internal drivers

Faculty members are key internal drivers in CoP planning and implementation because of their direct relationship with, and influence on, the university and students (Barnett *et al.*, 2014). It is important that educational institutions intending to implement the CoP address faculty enthusiasm and satisfaction with their work environment and academic career, through rationally modifying organisational structure, tenure, promotion, and merit systems. This ultimately improves their interdisciplinary connection and ownership of CoP (Austin & Duncan-Hewitt, 2005).

E4. External drivers

The external drivers are government agencies, such as professional licensing organisations, (Mayne *et al.*, 2015) and accreditation bodies (Evans, Guile & Harris, 2009). Governmental drivers should be well understood in order to secure appropriate support, and striving to meet accreditation standards should be a high priority, in order to attain and maintain accreditation status. Congruence among the requirements of government agencies, such as professional licensing organisations, accrediting bodies, and academic courses provides an advantage in designing an academic programme.

E5. Open communication and reciprocal knowledge exchange

Open communication among all members of the CoP has several advantages (Mayne *et al.*, 2015). One advantage is knowledge exchange, which allows academics, students, and practitioners to coach each other with relevant expertise based on background and professional experience (Andrew *et al.*, 2009). With knowledge exchange, faculty members and preceptors act as co-participants, sometimes demonstrating a lack of knowledge and at other times showing proficiency (Li *et al.*, 2009a), and hence, creating reciprocal relationships with students, who are peripheral participants (Sayer, 2014). Other advantages of open communication include making rational decisions, providing honest feedback, reducing unfavourable power hierarchies, and driving the professional development of all members (Andrew & Ferguson, 2008).

There are several key factors to secure open communication, such as mutual trust, respect, open dialogue (Li *et al.*, 2009a), and the contribution of all participants to decision making (Sayer, 2014; Mayne *et al.*, 2015). Utilising all forms of communication is fundamental to facilitate open communication; these forms include active and passive communications (Barnett *et al.*, 2014) and information technology (Li *et al.*, 2009a).

E6. Developing an organisational mission, strategic objectives and structure

It is essential to verify that the developed CoP plans and structure are guided by strategic objectives. These objectives must be quantitative, qualitative, and operational to guarantee their applicability, measurability and suitability. Objectives must also be aligned with adjustments in the organisation's mission and with modifications in the departmental structure (Duncan-Hewitt & Austin, 2005; Probst & Borzillo, 2008). This alignment enhances the appreciation of CoP by members of management, workers and end users, and ensures meeting the needs of all CoP members.

For example, the modification in departmental structure should reflect integration between science and practice to enable collaboration across disciplines. The departmental modification should be complemented with adjustments to admission policies, curricula, delivery and assessments (Duncan-Hewitt & Austin, 2005).

E7. Time requirement and regulatory policies for practical placement

Caring for patients in a healthcare setting (Ranse & Grealish, 2007) and the desire to become a more central participant in the community are the main motivators for student learning in the healthcare professions (White, 2010). These motivators are achieved through practical placement, where local knowledge is shared at the point of care delivery (Andrew & Ferguson, 2008). Hence, practical placement details should be well planned as part of CoP implementation.

Time requirements for teaching during practical placements and the regulatory policies to support student responsibilities are key details to be planned in order to achieve CoP operational objectives. Austin & Duncan-Hewitt (2005) argued that students would be an integral part of the pharmacy workforce if the time requirements for their practical placements were increased. This increase requires a major change to regulatory policies to support more independent work by students, greater accountability and responsibility, and an enhanced professional role (Austin & Duncan-Hewitt, 2005).

2. Challenges (CH)

It is important to recognise challenges to CoP, illustrated in Figure 1, prior to the planning and implementation phases, so that they are avoided. There is also an assumed two-way relationship between challenges and the education process pillars because they actively affect each other; therefore, avoiding these challenges is not a simple process and cannot be achieved immediately.

CH1. Different interpretations of CoP theory and subsequent lack of communication about it

The gradual evolution of CoP theory has led to inconsistency in the interpretation of the CoP concept in terms of defining, developing, applying and measuring its success (Li *et al.*, 2009a). It is therefore essential to have a common understanding of CoP and its specific measures and outcomes prior to implementation, and this common understanding should be effectively communicated to all CoP members.

CH2. Time constraints

Effective CoP implementation requires additional time for CoP members to be actively involved and engaged in its activities (Roberts, 2006), which might be unmanageable for some members. Hence, it is important to spread the ownership spirit of the CoP and the responsibilities for tasks among members, so that they accept and manage this additional load (Kerno, 2008).

CH3. Regional and contextual culture

CoP implementation is usually more successful in societies with stronger social structures that grow in a sociocultural environment, one that values groups,

harmony and collectivism (Roberts, 2006; Kerno, 2008). Hence, negative contextual factors in the practice environment, such as professional power, individuality and a lack of institutional commitment may obstruct the implementation of CoP (Austin & Duncan-Hewitt, 2005; Kislov, Harvey & Walshe, 2011).

CH4. Organisational hierarchies

The concept of CoP is usually effective in organisations that have individuals with similar professions and communication patterns. This functional similarity facilitates problem solving, knowledge exchange and open communication (Kerno, 2008). In hierarchical organisations, employees should be oriented to the fact that CoP is an instrument to increase their personal knowledge and improve organisational performance, and should be provided with success stories about CoP implementation (Kerno, 2008).

CH5. Students' lack of confidence in their own abilities

Students' lack of confidence has a strong effect on their transition from classroom environment to practical placement (Mayne *et al.*, 2015), which affects their participation in the CoP. Improving students' confidence can be achieved by exposing them to the CoP concept early and at different stages of their educational progression in an integrated fashion, and with a gradual increase in their responsibilities. Students' confidence can also be improved by involving them in goal setting. Improved student confidence neutralises the unequal power distribution between professors and students, improves student ownership of their learning, and enhances the transfer of knowledge in real practice. This ultimately facilitates students' movement from peripheral to core participation in the CoP (Austin & Duncan-Hewitt, 2005).

CH6. Balancing size and composition

It is important to keep a balance between the number of employees in an institution and the smallest number of members required for maintaining intimacy between CoP members (Sherbino *et al.*, 2010). The advantages of adding new members should be weighed against the disadvantages, keeping a careful eye on the balance of existing versus new members, because adding new individuals to a CoP could possibly reduce its effectiveness (Sherbino *et al.*, 2010). Hence, in an educational programme, the number of students placed at any one time, the number of preceptors, and the duration of placements are important factors that affect each other.

CH7. Rigidity of competences and competitive environment

In a competitive environment, employees are reluctant to share their efficient practices with one another because they trust their own competence. This environment negatively affects the reciprocal knowledge exchange

among practitioners, students and academics, which might lead to rigidity of competence and obstructed CoP implementation (Probst & Borzillo, 2008). Hence, it is important to orient CoP members to knowledge and experience sharing for the purpose of competence development, because this is a key part of CoP success.

3. Curriculum (C)

In this paper, 'curriculum' refers to the content, syllabus, learning outcomes, planned formal and informal learning, and extracurricular and learning activities provided in order to achieve professional competence (Mayne *et al.*, 2015; Offorma, 2016). Key elements that must be considered during the design of a CoP-based curriculum are presented in Figure 1. These elements maintain common ground with other learning theories, but they are discussed in this section in the context of the CoP.

C1. Formal and informal learning

Eraut (2004) argued that workplace learning occurs formally or informally and that these roles are complementary for effective practice and student competence (Allan & Smith, 2010). Formal workplace learning is intentional and has clear and identifiable goals, while informal learning is implicit, unplanned, and dependent on situational opportunities (Li *et al.*, 2009a). Formal learning takes the form of traditional teaching by an instructor, while informal learning in the workplace emerges through interaction and socialisation with other students and mentors. The importance of informal learning in a CoP makes the role of mentors significant and requires that they develop complex understanding of various teaching strategies (Allan & Smith, 2010) and of the implications of both formal and informal learning.

C2. Transfer of tacit knowledge to explicit knowledge and re-contextualisation

Garrow & Tawse (2009) argued that learning takes the form of a learning cycle involving four styles: socialisation, externalisation, combination and internalisation. One central goal of the CoP is the transfer of knowledge that is tacit into knowledge that is explicit through the socialisation and externalisation components of the learning cycle. In socialisation, knowledge is converted from tacit to tacit knowledge by bringing a learner's previous experience to the CoP. Then, by externalisation, knowledge is transferred from tacit to explicit. Hence, the learning cycle aligns with that of situational learning in the CoP, because learning occurs when an individual's internal thoughts are exposed to external analysis through social interaction, which adjusts those thoughts (Garrow & Tawse, 2009).

Another central goal of CoP is knowledge re-contextualisation as students move between the classroom and workplaces (Cope, Cuthbertson & Stoddart, 2000; Evans *et al.*, 2009). Knowledge re-

contextualisation implies that theory and practice possess a reciprocal relationship whereby theory learned in classrooms informs practice in work-based contexts, while practice informs theory taught in the classroom context. This requires an integration of the content-based and work-based elements of a curriculum (Allan & Smith, 2010) and student engagement in reflection (Evans *et al.*, 2009).

C3. Practical placement duration, sophistication and alignment to learner needs

White (2010) indicated that the details of practice placements are not sufficiently considered during curriculum design, which made the balance between theoretical and practical elements of a programme debatable.

In curriculum development, the duration of practice placements should be properly balanced between short placements, where students are observers, and extra-long placements, which prematurely treat students as practitioners (White, 2010). Another important detail to consider is the gradual increase in sophistication of tasks and responsibilities associated with different placements, based on a learner's skills. When the complexity of tasks increases, students become more central to the practice and less of a burden to mentors, which improves their confidence (Duncan-Hewitt & Austin, 2005). Also, curriculum design should consider students' reflection on their goals and needs, because they are adult learners who should have ownership of their learning (Fitzsimmons, 2007).

C4. Dual accreditation

The compatibility between professional licensing, accrediting body requirements, and course requirements allows for dual accreditation, where professional qualifications are aligned with licensing, accreditation and programme requirements, to serve a learner's best interests (Evans *et al.*, 2009). This requires that those bodies and agencies work with the academic programme in preparing aligned course requirements. The alignment should occur throughout the programme, especially in areas of entry to practice competences, practical assessment requirements, relicensing requirements and lifelong professional development (Mayne *et al.*, 2015).

C5. Partnerships between the university and practice sites

The integration of academia and practice through practical placements and subsequent engagement between academics and practitioners is fundamental to CoP (Cope *et al.*, 2000; Wenger *et al.*, 2002). This engagement results in the collection of resources, skills, knowledge, experiences and tools for addressing problems, and achieving a dynamic learning environment (Wenger *et al.*, 2002; Andrew & Ferguson, 2008). The collected resources are essential for greater productivity in research, education, clinical practice and customer

experience (Hean *et al.*, 2013). The integrated environment facilitates curricular change and professional development, with the goal of improving the practice and the dissemination of knowledge, along with the development of well-planned practice-based learning (Andrew & Ferguson, 2008).

Curriculum integration is an approach for making the learning experiences from various disciplines consistent and relevant to facilitate higher-order learning, apply knowledge to solve complex problems (Pearson & Hubball, 2012), and make students integrative thinkers (Ratka, 2012). This integration requires faculty members from different disciplines to communicate and contribute to the curriculum and teaching process. Practical placements in pharmacy are an example of an integrated curriculum where fundamental science courses are merged with pharmacy practice courses, which allow students to apply all parts of the curriculum in professional practice (Austin & Duncan-Hewitt, 2005).

Several integration methods could be selected by the academic programme, such as Harden's 11-step integration ladder (Harden, 2000), horizontal and vertical integration (Benor, 1982), the spiral curriculum model (Harden, 1999), and organisational themes (Husband *et al.*, 2014). The choice of one integration method over another depends on the administrative structure and needs of the programme.

4. Teaching strategies (TS)

This section describes the delivery of the practice-based element of the curriculum (practical placement), illustrated in Figure 1, and not the didactic element (classroom lectures). The reason for this focus is that the practice-based element of the curriculum in a professional educational programme has a stronger alignment with CoP theory; however, in a successful educational system, both elements complement each other.

TS1. Practical placement environment (learning environment)

Effective learning environments are fundamental in developing students' professional identity and shared identity among members (White, 2010). Several factors are important for ensuring an effective learning environment (Sayer, 2014): 1) good relationships are developed among students, mentors and health professionals (Field, 2004); 2) learners belong to the community (Thrysoe *et al.*, 2010), which is characterised by connectedness and mutual engagement in each other's personal interests during informal learning settings (Levett-Jones & Lathlean, 2008); and 3) students participate in the community through professional discussions and task distribution, producing feelings of being valued members (Thrysoe *et al.*, 2010). This participation should be planned based on students' capabilities and enthusiasm (White, 2010).

The practice placement site provides learners with opportunities to engage in increased stages of participation in the CoP, under the sponsorship of mentors. When they first join the placement site, they are peripheral participants, with nonexistent or low participation (Spouse, 1998). When students' familiarity with the context and ability to complete tasks independently increase, their professional competence grows and they become more central to the community (White, 2010; Sayer, 2014)

TS2. Mentoring strategies

There are several strategies for mentors when they are teaching students on practical placements (White, 2010), as demonstrated in Table IV. These mentoring strategies provide students with carefully planned support, which is reduced gradually to increase student independence as soon as their competence develops. Hence, it is important to structurally orient mentors to these strategies (Cope *et al.*, 2000).

TS3. Shadowing

Through shadowing, mentors shadow faculty while they teach in classrooms, and faculty members shadow mentors while they professionally practice in the practice sites, which allows them to share their professional experiences. Students shadowing each other is also an important strategy for students (Mayne *et al.*, 2015).

Shadowing has the benefit of aligning concepts taught in classrooms and practice sites, increasing the understanding of work practices and easing the student transitions from classroom to placement. Furthermore, shadowing develops the commitment of faculty and practitioners, strengthens their professional relationships, and helps them to engage in discussions about curriculum, teaching and assessment (Mayne *et al.*, 2015).

TS4. Peer support

Peer support reinforces the social nature of the learning environment through sharing of knowledge and experiences; this provides emotional care, assists novices in their tasks, enhances self-confidence and develops relationships. However, peer support might be disadvantageous and lead to a reduction of learning opportunities if peers are incompetent or when peers compete to perform the same clinical task (Ranse & Grealish, 2007).

TS5. Socialisation and acceptance

There are two kinds of acceptance: social acceptance and professional acceptance. A student's presence at the practice site facilitates familiarisation with context and social acceptance; this increases student confidence and ultimately increases the professional trust from experts

that is needed to confirm the student's competence and professional acceptance (Cope *et al.*, 2000). Students may become isolated when they are not socially accepted for some reason, or if a placement period is very short, which makes them observers only and prevents them from progressing to social and professional acceptance (Cope *et al.*, 2000). Hence, it is the responsibility of the academic programme to orient practice mentors and students to the significance of social acceptance, followed by professional acceptance.

TS6. Apprenticeship

The traditional apprenticeship model involves students' unstructured learning, by gaining experience from qualified staff and being included with the balance of staff in the workload of the practice site. Hence, the practice site is considered responsible for both task-oriented education and employment (White, 2010). More recently, the traditional apprenticeship model has evolved into the cognitive apprenticeship model, in which professional education has been shifted to the academic sector and mentors explicitly guide learners toward the cognitive features of professional tasks (Spilg, Siebert & Martin, 2012; Sayer, 2014). Through cognitive apprenticeship, students act as additional situated members at the practice site until they develop their competence (White, 2010). The concept of cognitive apprenticeship has been further developed into various mentoring strategies (Cope, Cuthbertson & Stoddart, 2000), explained in Section TS2.

Table IV: Mentoring strategies

Mentoring strategy	Explanation
Demonstration	Mentors demonstrate practices for students before letting them undertake real activity
Modelling	Mentors practice activities in front of students while drawing their attention to the key professional and behavioural elements
Coaching	Mentors provide students with feedback about their performance, based on the Vygotskian concepts of scaffolding and fading (Roberts, 2006)
Scaffolding	Students are allowed to try out techniques suitable for their abilities and skills, while the mentor is ready to be involved if needed
Fading	Students are given more responsibility and independence in a controlled manner, in order to gradually develop their competence
Articulation	Students explicitly communicate and express their understanding of practice
Reflection	Students compare their competence with that of the mentor or colleagues, which demonstrates knowledge contextualisation
Exploration	Students apply innovative approaches to their practice, possibly different from mentors' approaches, to solve professional problems

5. Assessment (A)

The Quality Assurance Agency for Higher Education in the United Kingdom (Quality Assurance Agency for Higher Education, 2013) explained that a good assessment is a learning experience that measures learning outcomes in an ongoing and reliable fashion, informs the instructor about student performance, offers a basis for decisions about student progression to a higher stage, and gives the opportunity for both the learner and the instructor to get constructive feedback (Garrow & Tawse, 2009).

Assessment activities based on CoP learning theories, identified in Figure 1, should assess students' performance in real practice settings, in order to evaluate students' ability to structure knowledge, utilise critical thinking, solve real practice problems, and get involved in goal setting (Maclellan, 2004).

A1. Educator expertise in assessment

It is important to explicitly introduce and practically mentor newly appointed educators to the expectations and process of the assessment system in a standardised manner. This mentorship should be evaluated, especially in areas of decision making related to assessment. However, a balance should be maintained between this structural orientation of new academics and giving them the opportunity to be creative within the assessment process (Garrow & Tawse, 2009).

A2. Ensuring valid and reliable assessment tools appropriate for use in progress decisions

In CoP theory, assessment tools are used for assessing different knowledge, skills, and attitudes, focusing on performance-based assessment because the majority of student learning is achieved through their practice placement. In performance-based assessment, an important factor to be considered is capturing specific skills and competences such as professionalism, communication and engagement (Janke *et al.*, 2012). Another factor to be considered is ensuring the validity and reliability of assessment tools. The reliability and validity assurance has positive outcomes on the educational institute, the professional body, and the community, because it implies robust measures of performance and ensures that the programme graduates knowledgeable and competent practitioners (Garrow & Tawse, 2009).

A3. Authentic assessment activities with progressively increased level of difficulty

In a CoP-based programme, the effectiveness of learning is improved by utilising authentic assessment activities. Such authentication can be achieved by allowing students to spend time with patients in real settings and then assessing them with case studies or clinical simulations. Objective Structured Clinical Examinations (OSCEs) provides another example of authentic student

assessment (Austin & Duncan-Hewitt, 2005). The complexity of the authentic assessment should be increased gradually, and various authentic and performance-based assessments should be considered in final decision making about a student's academic progression (Austin & Duncan-Hewitt, 2005).

A4. Collaboration between academia and practice in assessment

Collaboration between professionals from academic and practice institutions is fundamental for successful assessment planning and implementation (Sherbino *et al.*, 2010). Collaboration could be achieved by dividing professionals into sub-groups that have scholarly focus, such as developing new assessment instruments, creating a rotating leadership schedule, sharing potential costs, and networking regularly through appropriate channels (Janke *et al.*, 2012).

Peer collaboration with other health professionals is also beneficial because they are likely to have similar issues regarding assessment. This peer collaboration leads to the continuous evolution of assessment efforts and to improved inter-professional education (IPE) initiatives (Janke *et al.*, 2012).

A5. Planning the assessment activities

Assessment activities in a CoP based academic programme should be well planned in a proactive, self-directed, policy-oriented manner, so that they influence the standards of professional bodies, and vice versa. The assessment plans should also consider accreditation standards, resource constraints, and professional development needs in the area of assessment. Assessment plans should be revisited on a regular basis to ensure that they are effectively accomplished (Janke *et al.*, 2012).

A6. Balanced and comprehensive assessment system

In a comprehensive assessment system, summative and formative assessments complement each other in order to give a true image of student learning in relation to learning goals and to modify the traditional power structures of professors over students (Austin & Duncan-Hewitt, 2005).

Summative assessments are administered to students at a particular point of time to capture the alignment of particular content in the curriculum and student levels of achievement, and to measure the effectiveness of programmes. Formative assessments are considered as part of the teaching strategy and assessment process, because they allow students to be involved in their own learning through self-assessment, and tell both teachers and students about a student's progress. Hence, timely modifications in teaching strategies can be made to ensure successful learning experiences (Black, Harrison & Lee, 2003; Garrison & Ehringhaus, 2007)

A7. Best-practice assessment system

Considering a scholarly focus when planning for assessment activities is important because it enhances the use of best evidence-based assessment practices, which contribute to the evolution of research in the area of assessment (Janke *et al.*, 2012). CoP members should update their knowledge about assessment activities through regular review of journal articles or through attendance at conferences about assessment. It is important for an educational programme to seek out best practices for assessment that have been applied in peer institutions and then apply them within its context. It is also important that an educational programme records its experience with the assessment, so it is available for other interested institutions (Janke *et al.*, 2012).

A8. Quality assurance of assessment

The moderation of the assessment of student assignments is an important approach to the quality assurance of assessment. This moderation confirms the rigorous assessment of student work and the consistency across practice sites (Garrow & Tawse, 2009). Another key approach to quality assurance is the external examination, which functions as a key meta-level assessment process, peer review, and tool for sharing assessment practices between institutions (Quality Assurance Agency for Higher Education, 2013). Academics might see some of these approaches as displaying a lack of confidence in their assessment abilities. Therefore, these approaches should be introduced to mentors as quality mechanisms rather than as audits, giving mentors the opportunity to provide their feedback and make adjustments as needed (Garrow & Tawse, 2009).

6. Expected outcomes (O)

Implementing CoP theory has several positive outcomes, illustrated in Figure 1. The relationship between the outcomes, challenges, enablers and pillars is dynamic and does not reflect a sequential process. This means that some outcomes might start to appear even before implementing all enablers or education process pillars. However, the time requirements for transformations are dynamic, and the evidence required to evaluate outcomes is variable and not well established (Fung-Kee-Fung *et al.*, 2013).

CoP outcomes range from professional outcomes for members to improvements in organisational performance. These improvements occur as a consequence of a change in work practice or through the use of resources offered by the CoP, such as the adoption of a new process or increased patient satisfaction (Ranmuthugala *et al.*, 2011).

O1. Attitudes and interpersonal and professional skills development

CoP theory implementation allows students to learn by participation in real practice, and by observing the behaviour of other practitioners. This allows a more efficient attainment of behaviours (Li *et al.*, 2009a) and the development of a habitually skilled person, who uses the developed skills in the complex practice context (Ranse & Grealish, 2007).

Self- and shared leadership are examples of linked attitudes that develop within the CoP. These attitudes are facilitated by a decreased managerial structure and organisational investment in the talents of all employees (Ranmuthugala *et al.*, 2011). Other attitudes and skills are initiative, interpersonal skills and the work ethic of the community members (Seibert, 2015), as well as the attitude of a lifelong learner who adapts effectively to changes in both theory and practice (White, 2010). Finally, placing students in practical placements improves their professional skills, such as clinical judgment, through repetition of tasks and differentiation between usual and unusual tasks (Ranse & Grealish, 2007).

O2. Improved personal and organisational performance

Personal performance is increased with CoP implementation (Andrew & Ferguson, 2008; Bentley, Browman & Poole, 2010). This is demonstrated by greater adherence to workplace policies, greater job satisfaction (Bentley, Browman & Poole, 2010), increased retention of members (Sherbino *et al.*, 2010), rationalised workload (Duncan-Hewitt & Austin, 2005), and stronger identity. This enhanced personal performance facilitates reflective practice and encourages innovations. (Andrew & Ferguson, 2008). CoP implementation is also associated with an increased collaboration between academics and practitioners (Seibert, 2015). This results in more efficient practices in their corresponding organisations, shared resources, and informed problem solving and decision making (Seibert, 2015).

O3. Individual knowledge

Members of the CoP progress from a state of accepted knowledge to a state of transformed knowledge by looking differently at hidden interrelatedness and dealing differently with existing problems (Andrew & Ferguson, 2008). This results in learner progression from being peripheral members to being core members, which enhances their identity in the CoP and leads to deeper understanding of the pedagogic foundations of the practice (Andrew *et al.*, 2009). However, this move from a state of accepted knowledge to a state of transformed knowledge requires abandoning existing assumptions and practices, which is difficult and costly (Andrew & Ferguson, 2008).

O4. Integration

Collaboration between practitioners and academics has been considered a challenge because academics felt that practitioners lacked rigour and practitioners felt that academics lacked practical experience, which led to a mutual lack of respect (Andrew, Tolson & Ferguson, 2008). Hence, one of the key outcomes of CoP implementation is the collaboration between academics and practitioners in planning and implementing the mandates of the education process pillars, while recognising the importance of the skills and knowledge of both groups (Andrew *et al.*, 2008). This collaboration ultimately leads to integration between research and practice and between theory and practice.

Discussion

The use of CoP learning theory to achieve valuable outcomes has been examined across different sectors. This was demonstrated by a systematic review about CoP use in the business and healthcare sectors (Li *et al.*, 2009b) and in the healthcare sector (Ranmuthugala *et al.*, 2011). In the healthcare setting, CoP was applied as a strategy to encourage innovation, support health systems, increase people's quality of life and improve clinical practice (Kothari *et al.*, 2015). It was also applied to develop health policies (Bertone *et al.*, 2013) and to improve the quality of research in health practices (Jiwa *et al.*, 2011). In spite of the variability of these studies, Roberts (2015) claimed that there is generally a limited amount of CoP research within the healthcare practice sector, particularly into the outcomes of the adaptation and adoption of previously introduced CoP evaluation frameworks (McKellar *et al.*, 2014).

The use of CoP has also been explored in healthcare education, such as: medical (Pugsley, 2008; Bates *et al.*, 2013), occupational therapy and physiotherapy, nursing (Thrysoe *et al.*, 2010; McAllister, Oprescu & Jones, 2014), pharmacy (Austin & Duncan-Hewitt, 2005; Burton, Boschmans & Hoelson, 2013), and surgical medical education (Jaye, Egan & Smith-Han, 2010).

Some CoP research in healthcare education has focused on achieving specific outcomes. For example, Hart & Wolff (2006) investigated local community and university partnerships, Steinert (2011) investigated medical faculty development, Lees & Meyer (2011) discussed the facilitation of IPE, and Holden *et al.* (2015) explained the main challenges that hinder CoP implementation as the lack of a CoP conceptual framework and the lack of outcome and process measures. Educational literature did not describe the role and the approach to designing educational systems based on CoP or the process to comprehensively utilise the CoP theory in all aspects of education programmes.

Several healthcare education studies have highlighted the significance of using one learning theory in the design of a professional healthcare education programme for the sake of enhancing the consistency between the

curriculum planning, the teaching strategies and the assessment activities. For example, Botma *et al.*, (2015) argued that teaching and learning activities should ideally be integrated with outcome and assessment activities through the development of conceptual frameworks for educational design. Furthermore, Sadideen & Kneebone (2012) explained that creating a framework based on a selected learning theory could act as an evaluation tool for teaching strategies and as a predictor for the best teaching strategies in a particular setting, such as practical skills teaching. They noted that such a framework facilitates consistency. Furthermore, Kelly *et al.* (2016) indicated that pedagogical frameworks underpinned by learning theory helps programme designers to reduce the 'theory-practice gap' and students transfer of learning from theory to practice, as well as the development of a life-long learning culture. In line with this literature, it was felt that using one learning theory, the CoP, in the design and application of the Pharm.D. programme enhances the consistency between curriculum planning, teaching strategies and assessment activities.

This paper describes the development of an innovative theoretical CoP framework. The CoP framework developed in this research contains ideas and concepts from CoP learning theory. The CoP framework aims to establish a CoP-based education system, and to develop an alignment between CoP learning theory and educational practices. The development of this innovative theoretical CoP-based framework necessitated reviewing relevant literature, to conceptualise the enablers, challenges, curriculum, teaching strategies, assessment and expected outcomes in the theory.

It is important to reflect on the key strengths and weaknesses of the framework to improve its application.

Strengths

The CoP framework was developed based on rigorous literature review, using the Matrix Method (Garrard, 2013), from various healthcare professional education resources. During its development, it was peer-reviewed by scholars with healthcare educational expertise. This broad exposure to several professional healthcare education backgrounds enhances the utility of the CoP framework in various professional healthcare education programmes.

The CoP framework was developed as a theoretical instrument to be used either in guiding the design of new healthcare professional programmes or analysing the evidence for CoP theory in existing ones. Structuring the framework in six major components and elements is a novel addition to the education literature, which allows its application in the comprehensive analysis of an educational programme or in the analysis of a programme's selected components. As an example, the CoP framework was used as a theoretical instrument to analyse the evidence of CoP learning theory in the Pharm.D. programme at QU (Mukhalalati, 2016). This analysis demonstrates the effectiveness of the CoP

framework for this application and sheds light on the nature of the disconnect between CoP learning theory and the educational practices in that Pharm.D. programme, indicating that the disconnect is at the 'implicit disconnect' level. This means that some elements of the CoP framework were implicitly evident in the Pharm.D. programme at QU (Mukhalalati, 2016).

Limitations

The CoP framework was peer-reviewed by several scholars from healthcare education disciplines with experience of CoP; however, this peer review did not include critique through a particular set of criteria, such as those set by Tastle, Wierman & Dum Dum (2005) and used in the work of Botma *et al.* (2015). These criteria entailed an investigation of the clarity, appropriateness, applicability, transferability, credibility, importance and trustworthiness of the framework. It is important to note that the lack of evaluation criteria in the peer review of the CoP framework did not affect its applicability in the analysis of the QU Pharm.D. programme (Mukhalalati, 2016), but inclusion could have increased its credibility and trustworthiness.

The developed CoP framework is an evidence-informed review for the purpose of creating a theoretical instrument. However, it did not provide a practical step-by-step guide for two reasons. First, professional practice changes, which are based on CoP implementation, do not generally take place without system, cultural and governmental support (Kothari *et al.*, 2015). Second, the success and maturation of CoP are not linear processes, and they need time to develop. This suggests the need for a sequential application of its elements and a periodic evaluation of its achievements (Bertone *et al.*, 2013). The absence of a practical guide did not affect the use of the framework in the analysis of the QU Pharm.D. programme (Mukhalalati, 2016).

In summary, the developed CoP framework is novel in that it provides the basic conceptual structure that aligns CoP learning theory to educational practice. It can be used as a theoretical instrument to closely analyse the evidence of CoP learning theory in an existing Pharm.D. or other professional healthcare education programme, in order to gain better insight into the interaction between learning theory and practice. This was demonstrated in the analysis of the evidence of CoP learning theory in the Pharm.D. programme at QU (Mukhalalati, 2016). The CoP framework can also be used as a basic framework in the design of new Pharm.D. or other healthcare professional educational programmes. This is important to ensure a consistent alignment between learning theory and education practices, reduce the gap between theory and practice, and enhance students' experience.

The development of the CoP framework is a process that is constantly in flow and that evolves over time as specific circumstances change and as research in the healthcare education field progresses. Future research should focus on evaluating the application of the CoP framework in the design of new professional healthcare programmes, in order to determine its efficacy.

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