Identifying Measures to Foster Teachers’ Competence for Personal Learning Environment Conceived Teaching Scenarios: A Delphi Study

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ABSTRACT
Personal learning environment (PLE) is a learner centered and controlled environment where learner constructs knowledge socially and collaboratively with the help of knowledgeable peers, mentors, and teachers. Teacher, being the most knowledgeable other in this environment, has to develop a strong and multifunctional association between the learner and the PLE. However, in real world scenarios, this is not the case as teachers’ current competencies are not sufficiently developed to provide desired results. A major reason for this inefficiency is the unawareness of the required roles that a teacher has to play in such environments. Our study is aimed at identifying measures to foster teachers’ competence in PLE conceived teaching scenarios. We used the modified version of policy-Delphi in which we worked with 34 international experts who are either associated with PLEs in one of the four dimensions: teachers, researchers, designers, or practitioners. These experts reviewed a 10-item teachers’ PLE competency developing measures list, which we developed through an exhaustive literature review. As per Delphi procedure, the consensus on measures list was achieved in three rounds. During the process, participants collaboratively modified measures list at length and extended list from 10 items to 16 items. Based on the findings, we argue that institutional support is of prime importance to improve teachers’ PLE competence.

Categories and Subject Descriptors

General Terms
Management, Performance, Design, Human Factors.

Keywords
Teachers’ PLE competence, personalization, personalized learning, personal learning environment, PLE, policy-Delphi.

1. INTRODUCTION
Nowadays, it has been widely accepted within education and research community that teachers need to be meticulously competent not only in subject matter, but also emotionally intelligent in handling classroom related issues, technologically advanced in instructional and pedagogy related competencies, and should be knowledgeable regarding personalized learning and PLE conception [1][2][3].

Latest research findings regarding teachers’ competencies for Web 2.0, social software and advanced learning technologies context dispense many roles to teachers (other than their compulsory instructional and pedagogy related roles): planner of collaborative learning environment, constructor of learners’ learning plans, learning advisor, guide, and promoter of learners’ autonomy, confidence, and effectiveness [4][5][6][7].

In response to these developments, Shaikh [8] argues that competencies required of todays’ teachers for these changed learner-driven and –controlled scenarios should be reviewed strategically, carefully, and thoroughly in order to inform and transform todays’ teachers for upcoming risks and opportunities. Therefore, we decided to involve the real stakeholders – the PLE community – to sort out this matter. The aim was to identify measures which can be integrated or applied to any teacher training module in order to develop teachers’ emotional and professional competence for PLE conception teaching scenarios. However, while extracting the literature on this subject matter, we found that, prior to this study, only a few researchers (e.g., Downes [6], Shaikh [8], Alvarez et al. [9], Aragon [10], Minocha, et al. [11], Selvi [12]) have examined teachers’ PLE competences. In addition, to-date, the literature has not measured nor verified teachers’ capabilities for satisfying such competences [1][13]. Moreover, we also found that most of teachers’ characteristics and competences regarding personalizing of learners’ learning experiences have not yet been documented to-date. Thus, we deemed fit to use teachers’ PLE competency developing model (developed by Shaikh [8]) as a guiding reference for this study. The study was guided by the following research questions:

1. To what extent, are todays’ teachers capable of assuming the suggested new competencies?
2. Which measures need to be taken to develop teachers’ PLE competence that empower them to become entrenched in these new fields of learning?
For this study, we relied on the definition of competence proposed by McLagen [14] as “an area of knowledge or skill which is critical to the production of key outputs.”

The contribution of this paper is as follows: Research background is subject of Section 2, where relationships between 21st century learners and Web 2.0, personalization of learning and PLE, and applicability of Delphi in finding teachers’ PLE competencies, have been discussed. Research method is described in Section 3, while the analysis of data is carried out in Section 4. Section 5 portrays the results of study, which is followed by discussion on results in Section 6. Conclusion is the subject of Section 8.

2. RESEARCH BACKGROUND

Adapting learning that is learner-driven, self-directed, facilitated by experts and co-planned with other learners, and based on the needs and challenges of the individual learner is termed as personalized learning [15][16]. McLoughlin [17] argues that Web 2.0 plays a significant role in personalizing learning; “it enable learners to learn the way they deem fit and offer them greater flexibility and choice of options to personalize their learning.”

While reaffirming this statement, Chatti [18] argues that Web 2.0 applications (such as social networking, social bookmarking, wikis, blogs, mashups, webinars, and podcasts) are more intuitive, personalizable, and have built-in support to learn. These Web 2.0 applications enable the various aspects of learning such as content, mode of delivery, and access to be offered to learners, so that they can manage technology according to personal preferences [17][18].

Personal learning environment (PLE) is a learner centered and controlled environment where learner (exploiting the potential of Web 2.0 tools) constructs his knowledge socially and collaboratively with the help of knowledgeable peers, mentors, and teachers [19]. PLE provides a platform to collect and process information, connect people, and thus create value or knowledge [20]. Recent work at the crossroads of personalization of learning experiences and PLEs (e.g., McLoughlin [17], Compren, et al. [21], Pearson, et al. [22]) focuses on how to guide 21st century learners in developing their personalized learning spaces that enable them to mashup their heterogeneous learning resources at one place, allow them to interact socially with online learner communities, and share content through social media [23].

Dam, et al. [24] argue that teachers can create powerful motivational and creative force in learners by inducting personalization in their pedagogies. Arenas [25], and Attwell [26] suggest that augmenting learners’ cognition with personalized learning approaches should not be the only objective of improving teachers’ competencies, but they should also be empowered to familiarize learners with how to exploit PLEs for learning. Downes [6] argues that conceptualizing PLEs to learners require teachers to be behavioral scientists, psychologists, designers, planners, guides, and managers. Gaston [27] realizes that such changed phenomena increases the load on teachers’ professional responsibilities at work. They are expected to possess diverse set of competencies while performing many roles efficiently and effectively in order to be successful [28].

The above mentioned literature review suggests teachers’ required PLE competence against five categories. Shaikh [8] have divided teachers’ PLE roles into planning and design (P&D), instruction and learning (I&L), communication and interaction (C&I), management and administration (M&A), and use of technology (UoT) competences. This study seeks to identify teachers’ PLE competency developing measures in order to cultivate teachers’ PLE competence against these categories. To achieve this objective, we deemed fit to use modified-policy Delphi method of group consensus.

2.1 Using Delphi to Identify Measures to Cultivate Teachers’ PLE Competence

Delphi study is a technique of eliciting collective expertise for forecasting or measuring policymaking opinion of a group of geographically dispersed domain experts without being holding a face-to-face meeting. In order to reach a consensus or gain a stability in Delphi participants’ opinions, often a multiple-round probe is carried out [29]. Many variations of Delphis – called modified Delphi methods – have been developed and used recently [30]. Ranking-type Delphis rank probing items on participants’ votes [31]. Rating-type Delphs usually assign weights to likert-type scale options and thereby rank items. These days modified-policy Delphi techniques have been very popular among the research community [32][33]. These techniques have been used successfully in situations when the objective of study is not only to get consensus in participants’ viewpoints, but when stable results would also be considered in order to understand clearly the researched phenomena [30][33].

In the area of educational and learning technologies, many researchers have successfully used Delphi technique. The researchers (e.g., Shaikh [30], Holden [34], Pollard [35]) used it for forecasting future events and research trends. Brill et al. [36] and Yang [37] drew consensus on vague problems through this technique. In order to gain a better understanding of current practices and perceived obstacles, the researchers (e.g., Herring [38], Cramers, et al. [39], Williams, et al. [40]) deemed Delphi method useful. The selection of Delphi for this study was based on the facts that: (a) to-date, teacher communities keep only some knowledge about PLEs, personalization, and personalized learning teaching approaches; (b) since the field is considered new (so far) and the current situation is vague, many teachers and educational technology experts are still unaware of their roles and required PLE competence; and (c) many researchers desire to value the opinion of domain experts and ask them to inform the rest of community the importance of teachers’ roles and competence for teaching through PLE conception [6][8][17][26].

3. METHODOLOGY

This online Delphi took place asynchronously during a 7-weeks duration. Acknowledging the many distinguished features of Delphis and the nature of the problem in hand, we used its policy Delphi version. Typical for this Delphi was a heterogeneous response group. There was no face-to-face interaction, and participants reacted anonymously. We provided previous round feedback to each participant with due justification and need for proceeding to the next round. Conclusions were reached by majority consensus over probed measures.

3.1 Literature Survey for the Design of Questionnaire

In order to design a questionnaire instrument for probe, we reviewed a wide range of research material published between 2006 and 2011. Below we outline, which bibliographic resources we used as literature, the criteria we used for their selection, and the method we applied to carry out the review. We started our literature review with a check on ACM, IEEE, CUDOS,
3.2 Selection of Experts
We paid particular attention to search representative experts in teaching, research, and professional community that interests in PLEs. Thus, to explore the variety of views, a broad range of expertise for experts was pursued. We selected internationally reputed experts whose reputation was derived either from academic publications or professional record of achievements. At the start of study, only 36 participants returned filled demographic survey forms out of a total of 54 (who agreed to participate in response to Delphi invitation to 150 potential experts). However, in the third round, the number reduced to 34, as two participants could not return their responses in due time. Of the 34 participants, eight had an academic background as teachers, six were PLE researchers at the doctoral level, other six were PLE designers and or developers, and remaining 14 members introduced themselves as PLE practitioners or eLearning experts working as staff members or executives in commercial enterprises. Participants included both males and females (males=19, ratio=56 percent, and females=15, ratio=44 percent). There were six participants (two males and four females) with at least doctorate and or more advanced level qualifications.

3.3 Procedure of Conduct of Study
We (the first author of this study) personally invited to the attendees of The PLE Conference 2011 for participating in this Delphi. Another formal invitation was sent to widespread international PLE community through personalized emails, tweets, website entries, Facebook, and blog posts.

The study started with an introduction of Delphi studies, intended purpose of the study, explanation of the modified methodology, commitment of time and feedback required from participants, and results’ expectation by the researchers. We started the study by emailing FQ to 36 participants. This study lasted for three rounds until it achieved either some level of consensus or stability in participants’ opinions during the online discussion. Many participants expressed their personal opinions in open-ended questions. After each round, we provided participants the synopsis of new and old discussion topics. Participants’ agreement with the synopsis depicted the actual representation of the debate. Afterwards, we aggregated the results in a concluding report.

4. DATA ANALYSIS
From the second round onward, each participant was provided with the synopsis of previous round discussion and was asked to compare each of his or her response with that of panel mean value for that measure. Based on this review, we allowed participants to either change their previous round responses with panel mean values if they are satisfied with the panel point of view or retain their previous response(s) and justify their difference from panel opinion properly. We show in Table 1 the analysis of one of the probed measures during Delphi’s last two-rounds.

Table 1: Analysis of one of teachers’ PLE competency developing measures

<table>
<thead>
<tr>
<th>Measures</th>
<th>Round</th>
<th>Analysis</th>
<th>HD</th>
</tr>
</thead>
<tbody>
<tr>
<td>One way to motivate teachers to adopt the roles described is through workshops and pilot testing in order to prove them the benefits of PLEs.</td>
<td>2nd</td>
<td>3</td>
<td>3.9</td>
</tr>
<tr>
<td>3rd</td>
<td>4</td>
<td>4.2</td>
<td>0.5</td>
</tr>
</tbody>
</table>

The following abbreviations are applicable: R=Individual Rating; M=Panel Mean; IQR=Consensus level; HD=Highly Desirable

The analysis shows that during the third round of Delphi the measure achieved not only high-consensus, but was also designated to highly desirability measure status.

We sought participants’ responses for acceptance of teachers’ PLE competency developing measures on 5-1 likert type scale. The 25 to 75 percent interquartile range (IQR) was used to determine participants’ consensus. We relied on three consensus levels: high-consensus (H→IQR<=0.5), moderate-consensus (M→0.5<IQR<=1.0), and low-consensus (L→1.0<IQR<=1.5). We assumed consensus is achieved when an IQR of 1.0 or less has attained on most of the statements. Delphi participants were also asked to designate highly crucial measures as highly desirable (HD) measures.

Delphi studies are mainly aimed at drawing high consensus. Kenis [33] argues that the facilitators should be well-off at applying consensus results appropriately. Thus, we combined measure acceptance ratings, consensus ratings, and desirability ratings to generate a final status for a measure. Acceptance ratings were assigned unbiased weights (from +2 to -2), consensus ratings were assigned biased weights (H=0, M=1, L=-2), and HD measures were assigned a weight of 1.

5. RESULTS
Table 2 shows teachers’ PLE competency developing measures ranked on descending order of desirability rating (column 4). We witnessed participants’ personal approach to every measure. They shared their work experiences, everyday life observations, explorative thoughts, and tried to learn through collaborative sharing of ideas. The consensus developing process (column 3) shows moderate to high convergence (IQR<=1.0) in most of the statements; thus, we terminated the study at this stage and collected results. The results have been calculated using the formula explained in Section 4. The final status (column 5) shows the acceptance status of measures. Thus, the statements that gained strongly accept or accept status were termed as the results of this study.
Table 2: Showing Teachers’ PLE competency developing measures

<table>
<thead>
<tr>
<th>Measures</th>
<th>Agreement</th>
<th>Consensus</th>
<th>Desirability</th>
<th>Final Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dissemination of exemplary practices, support in the first uses of technology in class</td>
<td>A</td>
<td>H</td>
<td>HD</td>
<td>Strongly Accept</td>
</tr>
<tr>
<td>2. Management should provide reinforcement to teachers that put into practice these new roles.</td>
<td>A</td>
<td>H</td>
<td>HD</td>
<td>Strongly Accept</td>
</tr>
<tr>
<td>3. Organize workshops and pilot testing to prove them the benefits of PLEs.</td>
<td>A</td>
<td>H</td>
<td>HD</td>
<td>Strongly Accept</td>
</tr>
<tr>
<td>4. Teacher training programs should include courses that emphasize personalized learning principles and participation.</td>
<td>A</td>
<td>H</td>
<td>HD</td>
<td>Accept</td>
</tr>
<tr>
<td>5. Have teachers learn in environments similar to those we expect our students to learn in.</td>
<td>A</td>
<td>H</td>
<td>HD</td>
<td>Strongly Accept</td>
</tr>
<tr>
<td>6. Teachers should emphasize more on contextual use of tools and technologies in their pedagogies.</td>
<td>A</td>
<td>M</td>
<td>HD</td>
<td>Accept</td>
</tr>
<tr>
<td>7. For new teachers, the focus should be on giving instructional or learning designer training rather than the traditional instructional skills focusing on the presentation.</td>
<td>A</td>
<td>H</td>
<td>HD</td>
<td>Strongly Accept</td>
</tr>
<tr>
<td>8. Planning and Design competency (P&amp;D) should recognize peer sharing or exchange.</td>
<td>SA</td>
<td>H</td>
<td>D</td>
<td>Strongly Accept</td>
</tr>
<tr>
<td>9. Courses that include building and managing PLEs need be offered at a regular basis.</td>
<td>SA</td>
<td>M</td>
<td>D</td>
<td>Accept</td>
</tr>
<tr>
<td>10. Faculty evaluation modules include questions on teachers’ personalized learning approaches.</td>
<td>A</td>
<td>H</td>
<td>D</td>
<td>Accept</td>
</tr>
<tr>
<td>11. Expand face to face and virtual networking with learning leaders or missionaries.</td>
<td>A</td>
<td>H</td>
<td>D</td>
<td>Accept</td>
</tr>
<tr>
<td>12. Constructivism and Connectionism model methodologies can improve teachers’ PLE skills.</td>
<td>A</td>
<td>H</td>
<td>D</td>
<td>Accept</td>
</tr>
<tr>
<td>13. Incorporate into individual goal setting each year. One new thing to learn or try per term or something like that.</td>
<td>A</td>
<td>H</td>
<td>D</td>
<td>Accept</td>
</tr>
<tr>
<td>14. Teachers need to become involved with PLE skills. They will then develop and entrenched.</td>
<td>A</td>
<td>H</td>
<td>D</td>
<td>Accept</td>
</tr>
<tr>
<td>15. Release time for course development if more than incremental change is desired</td>
<td>A</td>
<td>H</td>
<td>D</td>
<td>Accept</td>
</tr>
<tr>
<td>16. Incorporate these skills set within teacher training and in service training.</td>
<td>SA</td>
<td>M</td>
<td>D</td>
<td>Accept</td>
</tr>
<tr>
<td>17. Teachers who adopt personalized learning in their pedagogies should be rewarded.</td>
<td>A</td>
<td>M</td>
<td>D</td>
<td>Undecided</td>
</tr>
</tbody>
</table>

The following abbreviations are applicable: SA=Strongly Agree/Accept=2; A=Agree/Accept=1; U=Undecided=0; DA=Disagree/Reject=−1; SD=Strongly Disagree/Reject=−2; H=High-consensus=0; M= Moderate-consensus=1; L=Low-consensus=−2

6. DISCUSSION

Here, we discuss on the measures which achieved strongly accept or accept status. During the three round process, participants extended the 10-statement measures list to 17 statements. However, only 16 measures were accepted by this study. Seventeenth measure (see Table 2) scored only zero marks; thus it gained an undecided measure status (as formula reveals: A=1 M=1 D=0, 1+(-1)+0=0=undecided)

Proposed measures’ list correspond to teachers’ five core PLE competences, and covers aspects of teachers’ training and development. The measures put emphasis on teachers’ required skills for performing PLE roles. Participants showed a strong desire for enhancing teachers’ PLE competence about how to use personalized learning skills in the classroom, how to think differently and innovatively, and how to get improved teachers’ current teaching skills while benefitting from PLE research. Thus, we suggest that teacher training modules should include training sessions which train teachers on how to design course material that is based on personalized learning instructional approaches. Participants also unanimously agreed on exploiting the constructionism and connectionism models of learning (learning together, learning through circles, reciprocal learning).

Evaluating the effectiveness and efficiency of teachers’ pedagogics in a classroom, it is suggested that teachers’ evaluation modules should include questions that measure students’ opinion for teachers’ personalized learning instructional approaches. This Delphi suggests that teachers should be skilled in instructional or learning design, context analyzing, planning, and programming in order to be able to design curriculum that would comply with personalized learning instructional requirements. Participants accept the need of a PLE-driven curriculum that incorporate teachers’ personalized learning instructional practices, and regular offering of courses that require students to build PLEs. Management support is also termed critical for teaching through PLE conception scenarios. Participants’ suggest teachers’ personalized learning efforts should be acknowledged by the management. Teachers’ may be rewarded honoraria, promotions, praises, etc.

Recognizing the extra efforts that teachers put on adopting personalized learning instructional approaches, this Delphi proposes measures about how to increase PLE competence of teachers. Participants suggest teachers’ should increase their PLE competence by practicing on PLE roles and skills. Teachers’ trainers should work on one PLE role or competency at a time, and move on to other activity after that. Teachers who have earned a considerable reputation in PLE practices should arrange workshops and seminars for other teachers. Recognizing the fact that Delphi participants put emphasis on teachers’ professional development, task compensations as well as teachers’ involvement in decision-making activities regarding teaching through PLE conception scenarios should inform administrator practice in developing effective learning programs.

7. CONCLUSIONS

This study proposes measures to develop teachers’ competence for teaching through PLE conception. In the end of study, Delphi
participants developed consensus for 16 PLE competency developing measures for teachers.

The findings of this study contribute and clarify to the growing body of research on teachers’ competence for PLE conception teaching scenarios. The results suggest that apart from teachers skills and competences, the nature and complexity of the tasks that teachers deal with in learning environments have been the key issues that need to be considered. It is reasonable to assume that the 34 Delphi experts belonged to teaching, research, and PLE industry serve as the random sample of the field. Their viewpoints are equally valuable to managers, teachers, researchers, and policy makers interested in PLEs. Thus, it is imperative that management heed the perceptions of these individuals.

In order to get the benefit from this study, we recommend applying these PLE competency developing measures in teacher training and development programs. Based on the findings, it is argued that support is extremely important for developing teachers’ PLE competence. Teachers need management support, compensation for extra time spent on curriculum development, and acknowledgement of their efforts. This study suggests teachers to be involved with proposed skills and accentuate on contextual use of technologies to their pedagogies; they will then develop and become entrenched in these new fields of learning.

7.1 Acknowledgements
We would like to extend our gratitude to the participants of this Delphi who made this project possible.

8. REFERENCES


