

# Attributes of Pre-Service and Inservice Teacher Satisfaction with Online Collaborative Mentoring

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## Abstract

This study examines Hungarian pre-service and inservice teachers' satisfaction (n=154) with the Mentored Innovation Model (MIM), an online collaborative mentoring model focused on technology integration. The Kano model was applied to results from two surveys to identify conditions in the MIM that most contribute to overall satisfaction with online mentoring. Self-efficacy with technology was identified as a must-be attribute. Online communication was a one-dimensional attribute contributing to linear increase of mentees' satisfaction, although preservice and inservice teachers' perceptions about the mentor's activity in the MIM differed. The results reinforce the importance of online communication during online collaborative mentoring.

*Keywords:* Online collaborative mentoring; teacher education; teacher development; teacher mentoring; Kano model

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Teacher education has a tradition of mentoring and apprenticeship where pre-service teachers observe mentor-teachers, receive feedback and support on initial teaching endeavors, and reflect on their experiences in real classrooms. Mentoring practices that include instructional, technical, and emotional support have been found to be necessary and effective in helping novice teachers learn how to teach and in preparing them for their future classrooms (Feiman-Nemser, 1998). This is also true of pre-service and inservice teachers learning to integrate technology in their teaching, where teacher modelling and collaboration with mentor teachers on the integrative use of technology in teaching and learning processes has been found to be effective (Aust, Newberry, O'Brian, & Thomas, 2005; Bullock, 2004).

While apprenticeship and mentoring in real classrooms is integral to teacher education, mentors who are experts in technology integration are not always available in every school or district where pre-service teachers complete their practica or where inservice teachers attempt to integrate technology. In this context, online technologies present tremendous potential for online mentoring where not only pre-service or inservice teachers but also the mentors can benefit from such interactions. In this paper we explore pre-service and inservice teachers' experiences with the Mentored Innovation Model (MIM), a model used for the online collaborative mentoring of teacher technology integration in Hungary.

The MIM (Dorner & Karpati, 2010; Dorner, 2012) is an online collaborative mentoring approach which focuses on authentic, problem-based classroom application of technology integration and combines multiple strategies for scaffolding pre-service and inservice teachers' technology integration in the teaching and learning process. In this paper, we present a brief overview of the implementation of the model for pre-service and inservice teacher technology integration in Hungary and use the Kano model (Kano, Seraku, Takahashi & Tsuji, 1984) to identify the conditions that contributed to participants' perceived development and satisfaction with their mentoring experience during the implementation.

## **Review of Related Literature**

### **Mentoring in Teacher Education**

To create authentic problem-solving situations where teachers learn “with computers, and not about them” (Kay, 2006, p. 390), researchers have suggested combining technology, pedagogy, and content and the curriculum-wide integration of technology (Kay, 2006; Tondeur, van Braak, Sang, Voogt, Fisser, & Ottenbreit-Leftwich, 2012). It has been found that role modelling, the provision of concrete examples of technology use in the classroom, and collaboration with mentor teachers on the integrative use of technology in teaching and learning processes are successful strategies (Aust et al., 2005; Bullock, 2004).

Mentoring in teacher education has been shown to improve confidence, self-esteem, classroom management skills, the ability to problem-solve and the ability to acclimatize to teaching contexts (Hobson, Ashby, Malderez, & Tomlinson, 2009; Mathur, Gehrke, & Kim, 2013). Most importantly, pre-service teachers have reported increased confidence using technology in their teaching (Koh & Divaharan, 2011), although Doering, Hughes and Huffman (2003) found that pre-service teachers tend to apply technology in a similar way to their mentor teachers. Interactions between pre-service teachers and mentors, levels of guidance by mentors, modelling by mentors, observations by pre-service teachers, discussions about teaching with technology with mentors, and the beliefs of mentors, as well as those of teacher educators, have been found to influence pre-service teacher integration of technology during their practicum (Bai & Ertmer, 2008; Grove, Strudler, & Odell, 2004; Haydn & Barton, 2007; Judge & O'Bannon, 2007). Mentoring programs that provide instructional, subject-specific and technical support but also opportunities for critical reflection as well as collaboration between mentors and mentees have been reported as successful (Feiman-Nemser, 1998). The Mentored Innovation Model (MIM) is one such mentoring program in which mentors and mentees engage in content-specific technology integration in authentic contexts and experiment with strategies of successful technology adoption.

## **The Mentored Innovation Model**

The MIM is an online collaborative mentoring approach consisting of three phases that aim to support pre-service and inservice teachers' technology integration in their teaching practices. It was developed in Hungary based on the European Pedagogical Information and Communications Technology License (EPICT) project and the Calibrate project, a European Union-funded international research and development project that involved schools, educational organizations, and ministries of education from eight member countries. The three phases of the MIM draw from Engeström's (1999) expansive learning cycles in organizational learning, namely, (1) questioning some aspects of accepted practice and existing wisdom, (2) analyzing the situation to find explanatory mechanisms, (3) modelling the idea that offers a solution to the problematic situation, (4) examining the model to see its limitations as well its potentials, (5) implementing the model by means of practical applications, and (6) reflecting on and consolidating the outcomes into a new form of practice (p. 7).

In the initial phase of the MIM implementation, mentees identify pedagogical and methodological problems of technology integration in collaboration with teacher educators, a subject-specific mentor, and educational researchers. In this phase, participants are expected to question and analyze current practices. In the second phase, once mentees have identified a problem that involves technology integration, mentors and peers work together to create a development project plan (for materials, resources, or lesson plans) and a joint research agenda about the targeted content areas. This phase focuses on helping pre-service and inservice teachers discuss, model, and examine new ideas, learning objects, and activity plans, etc., around practical, hands-on issues of applying technology to specific content areas. Throughout this second phase, sustained and on-going professional support is provided by the mentors using online technologies. In the third phase of the MIM, existing learning objects, activities, and lesson plans, etc., are identified and adapted or further developed in collaboration with peers, the teacher educator, and eventually, the subject-specific mentor. The design and application of technology integration strategies, which is likely to happen at the individual teacher's level, is documented by mentees in a reflective manner and co-researched with an educational researcher. This final phase is thus characterized by reflection on and consolidation of the outcomes that are eventually shaped into new forms of technology integration practices.

Mentoring experiences in the MIM are thus designed as online collaborations in which pre-service and inservice teachers solve problems and design materials collaboratively with teacher educators, mentor teachers, and educational researchers while reflecting on how technology can support their pedagogy. The MIM does not advocate for specific technologies, a single pedagogical approach or orientation to technology integration, but focuses on communities as learners. Mentees practice technology adoption and application strategies in online modules consisting of formal pedagogical Information and Communications Technology (ICT) training and share, develop, and critique learning resources in an informal online community of teacher educators, mentor teachers, and educational researchers. The MIM considers the needs of the mentees (e.g. pre-service or inservice teachers) and the technologies that are part of the curriculum, but emphasizes strategies of technology integration that can be transferred to other technologies and teaching environments.

## **Conditions for Successful Mentoring**

The MIM encompasses a complex system of online mentoring that is collaborative, involves multiple stakeholders, and aims for technology integration in teaching. Therefore, we

sought to identify the critical conditions that may contribute to mentees' perceived satisfaction in this implementation. As a first step, previous research on critical conditions or factors that contribute to the success of mentoring teachers for technology integration was explored. Technology self-efficacy, perceived satisfaction, online communication, mentor's activity, and social presence were identified as five areas that play a key role in the computer-supported mentoring of pre-service and inservice teacher technology integration in the literature. These areas are described further in the sections below.

### **Technology Self-efficacy**

Research on teachers' self-efficacy has found that it is one of the most relevant factors affecting behavior in using computers and information systems (Wang, Ertmer, & Newby, 2004). Self-efficacy, as defined by Bandura (1986), is a belief in one's own abilities to perform an action or activity necessary to do a task or to achieve a goal. Technology self-efficacy is understood as a teacher's judgment of their capability to use a computer or ICT to perform certain tasks (Wang et al., 2004). In online environments, self-efficacy influences one's ability to acquire skills, their choice of activities, and willingness to continue a course of action (Liaw & Huang, 2013). Similarly, teachers' self-efficacy with technology influences their use of ICT in teaching practice (Balanskat, Blamire, & Kafal, 2007). For teachers, lack of technology self-efficacy can hinder the embrace of technology in school practice, so much so that fear of failure and lack of ICT knowledge are often cited as reasons for technology not being integrated into teaching (Balanskat et al., 2007; Thomson, Schmidt, & Davis, 2003).

### **Perceived Satisfaction**

Perceived satisfaction is described as the aggregation of feelings and attitudes toward the various components impacting a given situation (Shee & Wang, 2008). Research on perceived satisfaction has revealed that it is a complex construct and its substance varies with the nature of the experience or case. Similar to other learning situations, collaborative mentoring processes are largely determined by mentees' perceived satisfaction while being mentored (Lin, Lin, & Laffey, 2008). Online communication and the mentor's role have been both identified as important priorities when reflecting on perceived satisfaction with an online learning situation and with online mentoring, in particular (Bierema & Merriam, 2002; DiRenzo, Linnehan, Shao, & Rosenberg, 2010).

### **Online Communication and Online Mentor Activity**

The importance of interactions and communication in in-person, online, one-to-one and collaborative mentoring has been researched and described at length (Chen, Chen & Tsai, 2009; Ensher, Heun, & Blanchard, 2003; Gareis & Nussbaum-Beach, 2007; Hew & Knapczyk, 2007). Communication has been identified as a critical indicator of success in online mentoring processes, notably, it is perceived as an important "measure" of whether pre-service and inservice teachers view interaction with their mentors as time well spent and as a contribution to their professional development (Gareis & Nussbaum-Beach, 2007). In particular, discussions that move beyond or complement the conventional mentor-to-novice exchange by fostering the network-like, collaborative interactions among teachers were found useful in addressing shared issues of professional practice (Yang & Liu, 2004). Nurturing reflective professional dialogues to support professional development is thus of paramount importance in online mentoring; however, it does not grow spontaneously out of professional relationships. In fact, numerous studies have highlighted inhibiting factors such as the lack of a perceived common purpose among participants,

a lack of a culture of shared, critical reflection about practice, and a lack of experience in using technology (Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shaw, & Liu, 2006).

Hence, skillful online mentors are needed to facilitate sustained and meaningful online communication, which is at the heart of successful mentoring. Online mentors do this through their facilitative role rather than through direct teaching (Hew & Knapczyk, 2007), and by carefully planning mentoring activities, moderating interactions characterized by decreased mentor-dependency and providing guidance on how teachers can assume increased control of their learning (Chen et al., 2009). Also, an effective mentor provides consistent, task-oriented and timely feedback since his/her helpfulness profoundly influences teachers' participation (Hew & Knapczyk, 2007; Yang & Liu, 2004). These findings suggest that teachers' professional growth during online mentoring is influenced by the collaborative communication skillfully facilitated by the online mentors and teachers' self-directed learning, which conditions long-term habits of reflection (Gore, 1987).

### **Social Presence in Online Teacher Communities**

Pre-service teachers often feel isolated during placement in schools as part of their practicum (Hramiak, 2010), and inservice teachers and beginning teachers, in particular, experience isolation and disconnectedness as sources of frustration (Macdonald, 1999). Online technologies and their potential to create space and place to enhance teacher training and professional development through mutual and collaborative support reduce isolation and could, according to Hramiak (2010), contribute to retaining potentially good teachers. Teacher trainees' sense of dispersion during the teaching practicum can be reduced and sense of connectedness enhanced through an online community. Stronger online communities characterized by mutual trust, respect and collaborative support exist when interactions support members to establish their social presence (Garrison, 2009). And, social presence that is defined as "the ability of participants to identify with the community, communicate purposefully in a trusting environment, and develop inter-personal relationships by way of projecting their individual personalities" (Garrison, 2009, p. 352) has been found to positively affect learning and perceived satisfaction (Hostetter & Busch, 2013; Richardson & Swan, 2003). Increasing pre-service teachers' sense of closeness to a community could support them to learn (Caspi & Blau, 2008) and develop openness toward effective technology integration (Beyerbach, Walsh, & Vannatta, 2001). Inservice teachers' disposition toward technology integration is mostly influenced by their peers in the local environment, so much so that how widely and by whom technology is integrated very much reflects the patterns of social relations among teachers within an institution (Zhao & Frank, 2003). Concurrently, a functional online teacher community supported by collaborative mentoring may play an important role in pre-service and inservice teachers' successful technology integration and learning with computers.

### **Research Questions**

The purpose of this study was to identify the critical conditions that impact mentees' perceived satisfaction with collaborative mentoring of technology integration during the implementation of the MIM. In doing so, areas that were identified in previous research as influencing pre-service and inservice teachers' technology integration during online mentoring were considered. In particular, the conditions that contributed to pre-service and inservice teachers' self-perceived development and their satisfaction with implementation of the online collaborative MIM were studied. This research will help to better tailor online collaborative

mentoring to participants' needs and channel these experiences directly into technology integration in school practice. The following research questions guided this study:

- What are the critical conditions that contribute to pre-service and inservice teachers' perceived satisfaction in the MIM? How do these conditions relate to each other?
- What is the relative priority of conditions to be improved in the MIM to enhance mentees' experience with mentoring for technology integration?

### **Methods**

Over four years, all three phases of the Mentored Innovation Model model were implemented with Hungarian pre-service (n=116) and inservice (n=43) teachers (Table 1) at a university that provided continuing professional development for inservice teachers and regular coursework for pre-service teachers. Inservice teachers who were previously involved in continuous professional development programs were approached and invited to participate. Preservice teachers who were in their practicum year or did compulsory coursework preceding it were invited to participate. Participation in both cohorts was voluntary. Online mentoring activities took place in Moodle and LeMill to form two online communities. One consisted of pre-service teachers, teacher educators, subject-specific teacher mentors, and educational researchers, with an aim to integrate technology integration with subject-matter and pedagogy before pre-service teachers began their practicum. In the second, inservice teachers voluntarily participated in the MIM that constituted a considerable part of their professional development. Similar to the pre-service teachers, inservice teachers participated in an online community with teacher educators, subject-specific mentors, and educational researchers to share, develop, and critique resources. All mentees explored online repositories such as the European Schoolnet's Learning Resource Exchange for Schools or Sulinet (which is a Hungarian portal with online teaching resources in Hungarian grouped according to subjects) for use in their teaching material design or technology integration. Online mentors who were experienced in online and face-to-face mentoring scaffolded subject-specific online collaborations in small-groups (5–6 members). Along with teacher educators, subject-specific mentors, and educational researchers, pre-service and inservice teachers identified a pedagogical problem related to technology integration; developed a project plan that involved the creation or adaptation of materials; developed a research plan using action research to study the technology integration in classroom context at a later stage, and reflected jointly on the technology-integration strategies. In order to identify the conditions that influence collaborative mentoring of teacher technology integration, it was necessary to first collect data from the project participants about the identified areas in the literature. To this effect, two online questionnaires were used in this study—a technology self-efficacy survey before the mentoring began and a mentoring satisfaction survey at the end of the MIM. All pre-service teachers and inservices teachers in the two MIM online communities at the university were invited to participate in the data collection.

	Inservice teachers (n=43)			
	Gender		Age	
	Female	Male	30-45 years	45-60 years
Number of participants	36	7	24	19
	Pre-service teachers (n=116)			
	Gender		Age	
	Female	Male	22-25 years	26-33 years
Number of participants	88	28	96	20

Table 1. Descriptive Statistics of the Participants

The development of each of these instruments and their implementation is described in the first two sections below. We provide separate reliability values for the pre-service and inservice teacher communities to demonstrate the internal reliability of the scales for both groups. Cronbach's alpha was used to assess internal consistency, to indicate the degree to which a set of items measures a single unidimensional latent construct. A factor analysis was not performed because the intention was not to further check dimensionality. The third section describes how the resulting data from these questionnaires was used to assess the Kano quality attributes or elements by relying on the empirical approach "importance-grid analysis" (IGA) (Vavra, 1997; Matzler & Sauerwein, 2002) that explored the conditions in the MIM that contributed to online collaborative mentoring.

### Reliability of Surveys

We used Cronbach's alpha to determine internal consistency of measured items. As the reliability statistics show, both surveys were found internally consistent and reliable (Table 2).

Reliability statistics			
Conditions	Cronbach's $\alpha_{pre}$	Cronbach's $\alpha_{in}$	N of items
Overall perceived satisfaction	.89	.78	8
Mentor's activity	.89	.89	5
Communication in online collaborative mentoring	.65	.82	8
Perceived social presence	.73	.84	4
Computer skills	.89	.96	29
Internet abilities	.79	.93	13

Table 2. Reliability Statistics of the Surveys Used

### Technology Self-efficacy Survey

The self-efficacy survey required the teachers to rate their computer use and Internet abilities, and was developed and validated during the European Calibrate project (Karpati & Blamire, 2008). The items in the survey were based on technology literacy standards for teachers from the United Nations Educational, Scientific and Cultural Organization (UNESCO) ICT Competence Framework for Teachers (UNESCO, 2008; 2011), which also incorporates standards from the International Society for Technology in Education (ISTE). The survey mapped pre-service and inservice teachers' perceived technology use and Internet abilities, specifically, their a) perceived fluency in technologies appropriate for the online activities in the MIM and b) perceived ability to transfer these skills to new technologies (online collaborative platforms, synchronous communication tools, etc.) Respondents (N=154) self-rated their skills on a four-point Likert scale (1-4, 1 stands for "without any help" and 4 stands for "I cannot do it") as follows: technology use (Inservice:  $M = 1.67$ ,  $SD = .72$ ; Pre-service:  $M = 1.49$ ,  $SD = .55$ ) and Internet abilities (Inservice:  $M = 1.38$ ,  $SD = .61$ ; Pre-service:  $M = 1.32$ ,  $SD = .59$ ). The results of the survey and descriptive statistics suggested that the respondents had a level of comfort with technology that was appropriate for participation in the MIM, that is, that they would be comfortable with the types of online activities in which pre-service and inservice teachers were expected to engage during the collaborative mentoring process (Dorner & Kumar, 2016).

### Mentoring Satisfaction Survey

While the technology self-efficacy survey covered the first area identified in the research, items in the mentoring satisfaction survey focused on the remaining conditions identified in prior research: (a) overall perceived satisfaction, (b) mentor's activity, (c) communication in online collaborative mentoring, and (d) perceived social presence. Satisfaction was explored by relying on the perceived (subjective) values provided by the participating pre-service and inservice teachers (N=154). The items used a four-point Likert scale (from 1 being strongly agree to 4 being strongly disagree).

The first variable group "overall perceived satisfaction" (eight items) (Inservice:  $M = 2.21$ ,  $SD = .46$ ; Pre-service:  $M = 1.85$ ,  $SD = .62$ ) referred to whether participants enjoyed the online mentoring experience, if the benefits gained justified the efforts, whether participants thought the experience was useful, if the content was interesting, whether the online mentor was accessible, and if participants were satisfied with the quality of mentoring and learning that took place. The second variable group "mentor's activity" (five items) (Inservice:  $M = 1.95$ ,  $SD = .60$ ; Pre-service:  $M = 1.92$ ,  $SD = .69$ ) focused on the mentor's role, whether she/he provided help, created a feeling of online community, facilitated discussions that enhanced collaborative learning, and whether her/his feedback contributed to the individual learning process. The third variable group "satisfaction with the online communication" (eight items) (Inservice:  $M = 2.26$ ,  $SD = .58$ ; Pre-service:  $M = 1.89$ ,  $SD = 1.03$ ) concentrated on whether collaboration in the online environment and participation in on-topic and off-topic discussions were a comfortable experience, if participants acknowledged each other's points of view, and whether participants felt comfortable conversing with the mentor in the online environment. The fourth variable group "social presence" (four items) (Inservice:  $M = 2.43$ ,  $SD = 1.02$ ; Pre-service:  $M = 2.05$ ,  $SD = 1.27$ ) referred to whether participants were able to form distinct individual impressions of their peers and the mentor, and whether the mentor acknowledged participants' individual points of view (Dorner & Karpati, 2010).



## Data Analysis

Data from the Mentoring Satisfaction Survey were used to assess Kano quality elements that had originally been introduced by Kano et al. (1984) in their methodology and model. This model demonstrates the nonlinear relationship between performance and satisfaction by weighting the importance of conditions and attributes that ultimately constitute priorities for development (Chen & Chuang, 2008; Matzler & Hinterhuber, 1998; Xu, Jiao, Yang, & Helander, 2009). The Kano model classifies attributes into four categories (Xu et al., 2009): (1) must-be or basic quality attributes; (2) one-dimensional or performance attributes; (3) attractive or excitement attributes; and (4) indifferent attributes. Must-be attributes are a must; their absence leads to extreme dissatisfaction. One-dimensional attributes entail those for which better fulfilment leads to linear increase of satisfaction, i.e. the higher this value, the more growth there is in satisfaction (Chen & Chuang, 2008). Attractive attributes are in general unexpected by the participants; their presence may lead to satisfaction (Xu et al., 2009). However, even if the level of attractive attributes is lower, satisfaction does not necessarily decrease. Indifferent attributes are those that the participant is not particularly interested in. Our aim was to explore the relative priority of conditions to be improved in the MIM. In other words, with the Kano model, designers and mentors can explore their mentees' satisfaction with the mentoring experience, establish the relative priority of conditions, and based on the results, initiate the redesign of mentoring processes, if needed.

IGA (Vavra, 1997) was used for the assessment of different conditions, that is, the Kano quality elements. IGA relies on explicit and implicit ratings of attribute importance: explicit ratings of the respondents (e.g. direct rating) and implicit ratings derived by regressing attribute performance against a global measure of performance (e.g. overall satisfaction) (Mikulic & Prebezac, 2011). Respondents' 4-scale direct ratings were converted to a 0-100 scale, which yielded single scores for each variable (dependent and independent). Regression analyses were computed, significant items were selected, and importance values calculated. Importance value is used to specify satisfaction indices that measure the quality of the mentoring process by incorporating the respondents' judgement in a weighted form. Based on the importance values, global indexes were calculated for the conditions. Using these indices, explanatory models that are outputs of categorical regression by optimal scaling were computed. These models elucidate relations between the five conditions. For the analysis of Kano quality elements standardized beta coefficients from multiple regression analyses were used (Mikulic & Prebezac, 2011).

## Results

To answer the first research question, we report the explanatory model-building (regression analysis) for how each group self-rated their satisfaction with the MIM separately. The needs, learning experiences, and perceived satisfaction of the pre-service and inservice teachers would have been different, thus the group-specific perspectives were analyzed separately. Results for the two groups were not compared through statistical analysis, because the aim was to explore group-specific perspectives of self-perceived satisfaction using explanatory models that are outputs of categorical regression by optimal scaling. The second research question focuses on the MIM as a model, and explores the relative priority of conditions to be improved in the MIM to enhance mentees' experience with collaborative mentoring for technology integration, thus mentees' (pre-service and inservice teachers') perspectives were aggregated.

### Critical Conditions Impacting Pre-service and Inservice Teachers' Satisfaction

Both explanatory models were significant ( $N_{\text{pre-service}} F(7, 84) = 12.19, p = .000, R^2 = .54, R^2_{\text{adjusted}} = .50$ ) ( $N_{\text{in-service}} F(4, 17) = 19.02, p = .000, R^2 = .82, R^2_{\text{adjusted}} = .78$ ). As the analyses indicate, the two communities (pre-service and inservice) shared the perception that communication in the online collaborative mentoring was the condition that impacted their overall satisfaction with the mentoring experience the most. In other words, satisfaction with online communication had the strongest significant impact on overall satisfaction ( $N_{\text{pre-service}} \text{Beta} = .83, \text{Importance} = .40, p < .001$ ) ( $N_{\text{in-service}} \text{Beta} = .86, \text{importance} = .94, p = .000$ ).

The mentor's activity, however, was judged differently by the two communities. Pre-service teachers perceived the mentors' activity to be more influential than the inservice teachers ( $N_{\text{pre-service}} \text{Beta} = .20, \text{Importance} = .02, p < .001$ ). In fact, satisfaction with the mentors' performance did not have an impact on inservice teachers' overall satisfaction. Perceived social presence did not have a significant impact on pre-service and inservice teachers' overall satisfaction. Importantly, however, pre-service teachers' satisfaction with the mentor's presence evolved as a central node in the model; it had a significant effect on perceived social presence ( $N_{\text{pre-service}} \text{Beta} = .15, \text{Importance} = .08, p < .009$ ) and communication in the online collaborative mentoring ( $N_{\text{pre-service}} \text{Beta} = .64, \text{Importance} = .12, p < .001$ ). Pre-service teachers perceived each other as real in the mentoring processes and became 'socially' visible to each other in the online collaborations. And yet, these dynamics were primarily orchestrated through the mentors' activity. These results conclusively indicate that mentors occupied a central position in overseeing and managing the online collaborative mentoring processes in the pre-service teacher community, whereas their role proved less important for inservice teachers' overall satisfaction.

### Relative Priority of Conditions for Online Collaborative Mentoring

It was aimed to identify the relative priority of conditions to be improved in the MIM by using the Kano quality elements. Data from the Technology Self-Efficacy Survey and the Mentoring Satisfaction Survey were included (Table 3 and Table 4). Communication in online mentoring collaborations was clearly identified as a one-dimensional attribute that leads to linear increase of satisfaction. It follows that pre-service and inservice teachers' overall satisfaction increases with the quality of communication in the online collaborative mentoring. It is thus the strongest predictor and driver of teachers' satisfaction in the MIM.

Pre-service and inservice teachers' self-efficacy for computer skills and Internet abilities were identified as must-be attributes, that is, lack of comfort level with technology negatively impacts overall satisfaction in online collaborative mentoring. Lack of self-efficacy for technology would thus lead to extreme dissatisfaction with teachers' self-perceived learning and would also hinder their ability to engage in virtually mentored technology integration.

<i>Model</i> <i>N= 154</i>	<i>R</i>	<i>R Square</i>	<i>Adjusted R square</i>	<i>Std. Error of the Estimate</i>	
1	.79	.62	.56	13.59	
<i>ANOVA</i>	<i>Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F</i>	<i>Significance</i>
<b>Regression</b>	<b>10226.00</b>	<b>5.00</b>	<b>2045.20</b>	<b>11.07</b>	<b>.000</b>
Residual	6280.72	34.00	184.73		
Total	16506.72	39.00			
<i>Predictors</i>	<i>Coefficients Beta</i>	<i>Std. Error</i>	<i>Coefficients Beta</i>	<i>t</i>	<i>Significance</i>
(Constant)	13.61	18.94		.72	.477
Mentor's role	.09	.17	.07	.54	.591
Social presence	.01	.16	.01	.06	.954
Communication in online collaborations	.98	.19	.73	5.09	.000
Internet abilities	14.56	6.04	.35	2.41	.022
Computer skills	15.98	4.90	.46	3.26	.003

Table 3. Barriers of In- and Pre-service Teachers' Satisfaction in Online Collaborative Mentoring

<i>Model</i> <i>N = 159</i>	<i>R</i>	<i>R Square</i>	<i>Adjusted R square</i>	<i>Std. Error of the Estimate</i>	
1	.48	.23	.16	11.95	
<i>ANOVA</i>	<i>Sum of Squares</i>	<i>Df</i>	<i>Mean Square</i>	<i>F</i>	<i>Significance</i>
Regression	2271.23	5.00	454.25	3.18	.014
Residual	7562.72	53.00	142.69		
Total	9833.95	58.00			
<i>Predictors</i>	<i>Coefficients Beta</i>	<i>Std. Error</i>	<i>Coefficients Beta</i>	<i>t</i>	<i>Significance</i>
(Constant)	17.98	24.91		.72	.474
Mentor's activity	-.17	.14	-.17	-1.24	.221
Social presence	.05	.14	.05	.34	.736
<b>Communication in online collaborations</b>	<b>.57</b>	<b>.17</b>	<b>.49</b>	<b>3.28</b>	<b>.002</b>
Internet skills	.73	6.36	.02	.11	.909
Computer abilities	5.92	5.66	.18	1.05	.300

Table 4. Drivers of In- and Pre-service Teachers' Satisfaction in Online Collaborative Mentoring

The analysis also revealed that neither mentor activity during online collaborative mentoring nor perceived social presence were statistically significant attributes. This indicates that these conditions, as stand-alone variables, do not affect teachers' overall satisfaction significantly in the MIM. This finding was unexpected as both dimensions were significantly influential and had high importance in the stepwise model building. No attractive or indifferent dimensions were identified.

## Discussion

Higher education institutions have a strong tradition of using teaching evaluations with the aim of continuously improving the quality of instruction provided to students (Chien, 2007; El-Sayed & Burke, 2010). The Kano method, one of the many alternatives, is gaining currency in surveying student satisfaction in university programs, notably, to identify elements of a curriculum that impact student satisfaction (Arefi, Heidari, Morkani, & Zandi, 2012; Sung, 2009). Nevertheless, the Kano method, as is the case with much survey research, has its limitations that relate to two issues 1) it operates with self-rated values and 2) prior to data collection, it requires the researcher to define the list of quality attributes to be investigated from existing literature and previous cases (Chan, Rosemann, & Tan, 2014). While acknowledging the method's limitations, it can nevertheless help to determine aspects and attributes of a program that have been previously less documented or simply overlooked. The following sections discuss the findings and their implications for future implementations of the MIM.

The Mentored Innovation Model (MIM) is a three-phase approach to online collaborative mentoring of teacher technology integration that has been implemented in Hungary with both pre-service and inservice teacher communities. This study sought to identify critical conditions that influence online collaborative mentoring in the MIM by a) determining areas highlighted by prior research as critical for online teacher mentoring, b) creating and implementing two surveys that covered those areas from prior literature that are critical for online collaborative mentoring of teachers and c) using the Kano quality elements to identify critical conditions related to teachers' overall satisfaction with online collaborative mentoring in the MIM. The purpose of this research was to identify and eventually improve the conditions in the MIM that most contribute to overall satisfaction with mentoring. Given the complexity and multiple processes that are entailed in the MIM, it was important to determine conditions that contribute to its success so that those conditions might be supported and emphasized in future implementations.

Areas that were identified as influencing online mentoring of pre-service and inservice teacher technology integration in prior literature and that were used in this study were technology self-efficacy, perceived satisfaction, online communication, mentor's activity, and social presence. Perceived technology skills and Internet abilities were identified as must-be attributes in the MIM. Hence, the success of online collaborative mentoring, such as the MIM, largely depends on teachers' perceived comfort level with technology. Both pre-service and inservice teachers need a minimum level of skills using technology and communicating in the online environment in order to fully participate and benefit from online mentoring. Lack of technology self-efficacy can also impede technology integration in classroom practice, the final goal of the MIM (Balanskat et al., 2007; Peralta & Costa, 2007). In this study, self-ratings were used in surveys to assess mentees' technology self-efficacy before beginning the mentoring process. For successful online mentoring

in the MIM or in other models, it might be useful to additionally determine whether mentees possess the skills needed or have to be taught those skills in the initial stages of the mentoring process.

The results demonstrated that communication is central in online collaborative mentoring. It directly and significantly impacted pre-service and inservice teachers' overall satisfaction and thus evolved as the strongest driver of their satisfaction in online collaborative mentoring. This finding implies linearity, that is, the more teachers are satisfied with this condition, the higher their overall satisfaction with the mentoring experience. It also reinforces prior research on the crucial nature of communication in online mentoring (Gareis & Nussbaum-Beach, 2007) and emphasizes the need for further research on the types of communication and feedback in the MIM or in other online collaborative mentoring that are perceived as most beneficial by mentees. From a teacher education perspective, the results highlight the value of professional development for online mentors on the ways in which online communication can be used in online collaborative mentoring.

Mentors' activity was profoundly important in the pre-service group; it evolved as an overarching condition that had a direct significant impact on pre-service teachers' overall satisfaction, perceived social presence, and communication in online collaborative mentoring. In contrast, satisfaction with mentor performance did not significantly impact inservice teachers' overall satisfaction in this research. This suggests that inservice teachers might have needed less support or perceived the mentors' role to be less important, and that pre-service teachers experienced a greater need for guidance by a senior expert. It is also possible that inservice teachers, as experienced professionals, regarded each other and their mentors as members of a democratic community where leadership roles are interchangeable, depending on the purposes of the actual problem-solving situation in collaborative mentoring. These results also point to the importance of defining and making transparent the mentor role in online collaborative mentoring. This can be done if the mentors communicate their role and ways in which they will be available to guide mentees, whether those mentees are pre-service or inservice teachers.

Social presence was not identified as a prominent condition in this study. It was neither a driver nor a barrier of teachers' satisfaction. This somewhat contradicts results of prior studies that found that online communities enhance pre-service and inservice teachers' connectedness and reduce their sense of dispersion (Hramiak, 2010; Thurston, 2005). While social presence is important to build collegiality and create comfort during mentoring, the online collaborative mentoring in this study took place in a formal context; therefore it is possible that in order to learn social presence was not as crucial for the participants as their communication with the mentor.

### **Recommendations for Future Research**

This research deals with the application of the Kano quality elements in a specific instructional setting, the MIM, with two mentee communities of exclusively inservice and pre-service teachers. Despite the unique institutional and regional considerations that impede the generalizability of the results to other settings and contexts, this research highlights the possibility of incorporating the Kano quality attributes in future research on online collaborative mentoring models and in program design to identify conditions contributing to participant satisfaction. Given the dynamic relationships among variables that inherently define online collaborative mentoring processes in the mentoring of teacher technology integration, more variables (specific to the instructional design at hand) can be assessed concurrently in future research. It would also be

important to study actual technology integration that results from online mentoring of pre-service and inservice teachers or online collaborative mentoring as in the MIM, to validate the success of the model.

The monitoring of mentees' satisfaction should be a fundamental pedagogical strategy in designing online collaborative mentoring scenarios. From the mentees' perspective, successful (online) learning is a transformative process that best proceeds with reflection. Equally important, systematic reflection is also indispensable for mentors; as mentors of online processes, it is their responsibility to revise mechanisms and implement modifications in order to leverage mentees' learning. The Kano categorization of attributes could thus be relevant to practitioners who are involved in these highly reflective processes.

This research indicates that effective online communications and transparency in the role of the mentor should be an integral part of the instructional design of online collaborative mentoring. Further, the instructional design should be informed by a thorough investigation of participants' technology skills and technology self-efficacy, and a needs analysis of the level and types of guidance expected by mentees based on their previous experiences and existing expertise. A comprehensive picture of mentees' anticipations, prior knowledge, and skills will enable course designers and mentors to design online mentoring experiences that meet expectations and respond to mentees' actual needs.

As teacher education programs proceed to include more blended and virtual components in coursework and practica, this research emphasizes not just the need for instructional design of online and blended collaborative experiences and the careful planning of various phases of technology integration in an online community, but for increased attention to online communication. Notwithstanding existing research in other environments, teacher education would benefit from research on the ways in which mentors communicate, guide, and provide feedback in online and blended teacher education environments, and the frequency or media that is used to interact with their mentees with the final goal of technology integration.

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