Moroccan Teachers' Perceptions and Concerns about ICT Integration

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Abstract

Integrating technology into teaching practices often changes teachers' work patterns. Thus, several studies have insisted on supporting such change by understanding teachers' concerns. The present study adopts the Concerns-Based Adoption Model (CBAM) as a conceptual framework to examine Moroccan teachers' concerns about integrating information and communications technology (ICT). To this end, we relied on a self-reporting instrument for a sample of teachers (n = 382) from two Regional Academies of Education. Our findings suggest that the overall profile of teachers' stages of concern (SoC) is that of "reluctant" non-users. This profile showed high percentiles for the first three SoC, a low consequence stage percentile, medium percentiles for the management and collaboration stages, and a tailing up at the refocusing stage. Furthermore, the results highlighted a positive relationship between teachers' concerns about integrating ICT and previous continuous training on the one hand and the pandemic's impact on their attitudes toward self-training on the other. In addition, significant differences in teachers' concerns regarding teaching experience and age were found. Our study provides change leaders insight into teachers' concerns about integrating technology which will help the field design appropriate interventions to reduce their limiting concerns.

Keywords: CBAM, COVID-19, ICT, Morocco, stages of concern, teachers

Morocco has made significant efforts to improve the quality of national schools' outcomes. This reform dynamic extends from the National Charter of Education announcement (2000) until the promulgation of framework law 51.17 on the education system (2019). Moreover, integrating Information and Communication Technologies (ICT) into teaching practices and related training were common components of all reform stations. However, the opportunities technology can bring to improve learning quality must be better tapped (The Ministry of National Education, 2022). Such a conclusion raises the question of teachers' training efficiency regarding ICT integration: Does the formal training effectively meet their real needs? Responding to teachers' real training needs to keep up with the change entailed by reform is crucial in ensuring their proactivity (Brinkerhoff, 2006; Magallanes et al., 2022). Nevertheless, professional training is historically designed based on what policymakers assume educators need rather than what they effectively need (Vaughan, 2002). Furthermore, the COVID-19 crisis revealed the important role of technology in teaching and learning activities (Hansson, 2021; Tzankova et al., 2023), and it also highlighted the need for rethinking teachers' professional training in ICT (Stracke et al., 2022).

Based on the Concerns-Based Adoption Model (CBAM) (Hall et al., 1973), the present study examined teachers' concerns about integrating ICT. The study took place in the context of the reform of the Moroccan educational system. Early in the previous year, the Ministry of Education launched national consultations in order to reinvigorate the reform process embodied in law 51.17. Thus, a roadmap for the next four years (2022-2026) was developed based on these consultations (The Ministry of National Education, 2022). This roadmap set 12 commitments needed to enhance the national schools' outcomes. The integration of ICT into teaching practices and related professional development were included in the 2nd , the 6th, and the 9th commitments. Thus, the aim of this study was to understand teachers' needs in terms of technology integration to help in designing appropriate professional development. Furthermore, we think that our study's relevance stems from three other particularities. First, our understanding of ICT continuous training includes not only formal professional development but also the personal effort of self-training that takes place in informal settings. Second, our study integrates the COVID-19 crisis as a new independent variable to examine its potential influence on teachers' concerns about integrating technology. Finally, we followed a rigorous data analysis procedure based on the guidelines proposed by George et al. (2013).

Thus, according to what we mentioned earlier, and by considering the integration of ICT as a source of change, the present study aimed to meet two research objectives: (1) Explore Moroccan teachers' concerns about integrating ICT into their teaching practices and (2) Examine the sensitivity of teachers' concerns toward continuous training in ICT and the teaching experience amid the COVID-19 crisis.

Literature Review

The Concerns-Based Adoption Model

Many studies stressed the significant influence of teachers' feelings and perceptions on their effective integration of technology (Baytar et al., 2023; Fearnley & Amora, 2020; Huang et al., 2023; Njiku et al., 2019). Fuller (1969) was the first to call these feelings and perceptions "concerns." In her theory of concerns, based on a series of studies on student teachers, Fuller believed that teacher education programs should meet their concerns which move theoretically through a four-level continuum: unrelated-concerns, self-concerns, task-concerns, and impact-concerns. Four years later, Hall et al. (1973), relying on Fuller's work, proposed the conceptual framework known as the Concerns-Based Adoption Model (CBAM). This model was supposed to help change leaders identify the concerns of an innovation's implementers in order to facilitate the change process by designing appropriate interventions (Ohlemann et al., 2023). Concerns are defined as "the composite representation of the feelings, preoccupations, thoughts, and considerations given to a particular issue or task" (Hall & Hord, 2014, p. 85). Hence, Hall et al. (1977) built a 35-item questionnaire where they displayed seven stages of concern (SoC) through the four levels suggested by Fuller (1969) (Table 1).

Table 1
Stages of Concern Descriptions

Levels of concern	Stages of concern	Description
IMPACT	(6) Refocusing	The implementer has new and innovative ideas on how to improve/change the innovation's actions.
	(5) Collaboration	The implementer is more concerned about co-work and collaborating with others.
	(4) Consequence	The implementer is more concerned about how the innovation might affect his/her learners.
TASK	(3) Management	All the implementer's interest is focused on preparing materials.
SELF	(2) Personal	The implementer is more concerned about how the innovation might impact him/her.
	(1) Informational	The implementer is curious about gathering information about the innovation.
UNRELATED	(0) Unconcerned	The implementer is not concerned about the innovation; he/she is more interested in other activities or tasks.

According to Hall and Hord (2014), implementing innovation is a source of change, which entails implementers' resistance. Hall and Hord (2014) argued change leaders should understand implementers' concerns in order to reduce their résistance. For them, the apparent

resistance would be just a symptom of "grief" resulting from leaving his/her comfort zone, that is, moving from doing comfortable tasks to implementing new instructions. Thus, they insisted on considering the change as a "process" rather than an "event" to give time for implementers to learn and improve their practices (Hall & Hord, 2014, p. 11).

Related Studies

In conducting our literature review, we were able to distinguish three types of studies: studies that addressed teachers' concerns about ICT integration in general, (e.g., Agormedah et al., 2019; Dele-Ajayi et al., 2021; Dubey, 2016; Sarfo et al., 2017), studies that examined concerns regarding a particular technology after a period of implementation, (e.g., Alnujaidi, 2021; Amankwah et al., 2022; Gu et al., 2023; He & Yusop, 2020), and studies that addressed concerns between two points of time (t_1 and t_2) during a defined period (weeks or months) of a professional development program (e.g., Georgiou & Ioannou, 2019; Kayaduman & Demirel, 2019; Ziegenfuss et al., 2019). Thus, in Dele-Ajayi et al.'s study (2021), the concerns of 340 Nigerian teachers about ICT integration were higher at stages 0, 3, and 1, and lower at stages 5 and 4. Additionally, significant differences were found at the SoC in terms of age, level taught, and teaching experience. Moreover, Dubey's (2016) study suggested higher self-concerns (stages 0, 1 and 2) of 190 in-service teachers about ICT integration with no interesting differences regarding participants' age and teaching experience. In addition, Agormedah et al. (2019) found that the concerns of 66 Business Studies teachers were intense at stages 4 and 1 and low at stage 0, with no significant differences according to teachers' characteristics (teaching experience, age, and gender). Furthermore, as an example of the second category of studies, in Alnujaidi's study (2021), the concerns about "Mobile Assisted Language Learning" of 130 Saudi in-service teachers were intense at stages 1, 2, and 3. The later study highlighted the role of attending previous professional development related to this technology in decreasing self-concerns and increasing impact-concerns (stages 4, 5, and 6). Finally, as an example of the third category of studies, Georgiou and Ioannou (2019) found that the concerns of 31 in-service teachers at the end of a professional development program on "Technology-Enhanced Embodied Learning" were higher at stages 1, 5, and 6. Finally, it is noteworthy that we did not find studies that adopted the CBAM conceptual framework to examine teachers' concerns about integrating ICT within the Moroccan context.

The present study contributes to the research dynamic described above. It relies on the CBAM model as a reliable and valid theoretical framework, used on a large scale, to explore Moroccan teachers' concerns regarding integrating technology. Moreover, our research's particularities, mentioned earlier, will help generate original results that could enrich scientific discussion on technology integration in education as an innovation that entails a change in teaching practices.

Method

Research Design

Our study adopted a quantitative research design to explore Moroccan teachers' concerns regarding ICT integration. After a validation stage with a limited population (17 participants), the SoC questionnaire was used to collect data from elementary and secondary school teachers (n = 382) belonging to two Regional Academies of Education. All data were analyzed using descriptive and inferential statistics.

Participants

Our study population comprised 382 teachers from the three national education system levels: elementary, middle, and high school. Individuals in this sample represented teachers working in two Regional Academies of Education: The Academy of Marrakech-Safi and the Academy of Casablanca-Settat. Participants filled out a questionnaire (described below) with their consent after obtaining our commitment to respect the anonymity of answers and to use their responses for purely academic purposes. Moreover, the research objectives were clear to the respondents. Table 2 displays more details about the participants' demographics.

Table 2
Demographics of Teacher Participants

Variable	Categories	n	%	Variable	Categories	n	%
Gender	Female	170	44.5	Diploma	Doctorate	13	3.4
	Male	212	55.5		Master	86	22.5
Age	20-30 years	102	26.7		Bachelor	238	62.3
	31-40 years	120	31.4		Baccalaureate + 2	26	6.8
	41-50 years	114	29.8		Baccalaureate	19	5.0
	51 and over	46	12.0	Teaching level	Elementary school	135	35.3
Teaching experience	1 - 5 years	111	29.1		Middle school	151	39.5
	6 - 15 years	121	31.7		High school	96	25.1
	16 - 25 years	119	31.2	School subject	Elementary	129	33.8
	26 and over	31	8.1		Scientific	65	17.0
Workplace	Rural	140	36.6		Literary	168	44.0
	Urban	242	63.4		Activity	20	5.2

Instrument

As detailed earlier, our study adopts the CBAM conceptual model to examine teachers' concerns about integrating ICT. Hence, our survey's instrument was the 35-item questionnaire elaborated by Hall et al. (1977) and published by George et al. (2013, pp. 27–28). Thus, to adapt the questionnaire statements to our research objectives, we substituted "innovation" with

"ICT." The 35 items of the questionnaire are divided into seven stages of five items each. The answer to the items is made according to a seven-option Likert-scale (0 = Irrelevant; 1 and 2 = Not true of me now; 3,4, and 5 = Somewhat true of me now; and 6 and 7 =Very true of me now). Besides the 35 items, we added questions about participants' demographics and two Yes/No questions designed to address the second research objective. The first such question asked, "Have you received any training in using ICT, whatever form it takes (in a formal or informal setting)?". The second question asked, "Given that the COVID-19 crisis did highlight the importance of using ICT, did you make a self-training effort to develop your competence in using ICT after the outbreak of this crisis?"

The questionnaire was administered in Arabic. Thus, a translation validation was needed. As a first step, the researchers collaborated with an English teacher, who had experience using ICT, to translate the original questionnaire into Arabic, taking into account the participants' culture. Subsequently, two other English teachers with the same profile scored the previous translation's accuracy based on a 10-point grade for each item and suggested rectifications, if any. Consequently, the questionnaire items scored between 8 and 10. The researchers and the first English teacher discussed the items, suggested rectifications, and made necessary changes. Moreover, the researchers pretested the revised questionnaire among 17 participants to check its clarity and appropriateness.

As for the questionnaire's internal reliability, the overall Cronbach's α coefficient was .959, and Cronbach's α coefficient of the seven SoC ranged from .588 to .896 (Table 3). An outstanding remark noted during our literature review is the low Cronbach's α coefficient of Stage 0 found in most studies, (e.g., Hall et al., 1977; Ashrafzadeh & Sayadian, 2015; Alnujaidi, 2021). Generally, the high Cronbach's alpha coefficients found for our instrument were deemed satisfying.

Data Collection and Analysis

The data collection was performed through two modes: paper-and-pencil and online format. Within the final sample (n =382), 73 (19.1%) paper and 309 (80.9%) online questionnaires were deemed valid. As for the data analysis, SPSS.22 software was used to make the analysis necessary to meet the two research objectives. Furthermore, as mentioned earlier, a rigorous data analysis and interpretation procedure, recommended by George et al. (2013), was followed. To illustrate the overall profile of concerns, we first averaged the seven stages' raw scores and then converted the averages to percentiles. To this end, we built a program in Excel to convert raw scores to percentiles. As for the inferential statistics, we used raw scores instead of percentiles.

Table 3
Cronbach's Alpha Coefficient by Stage

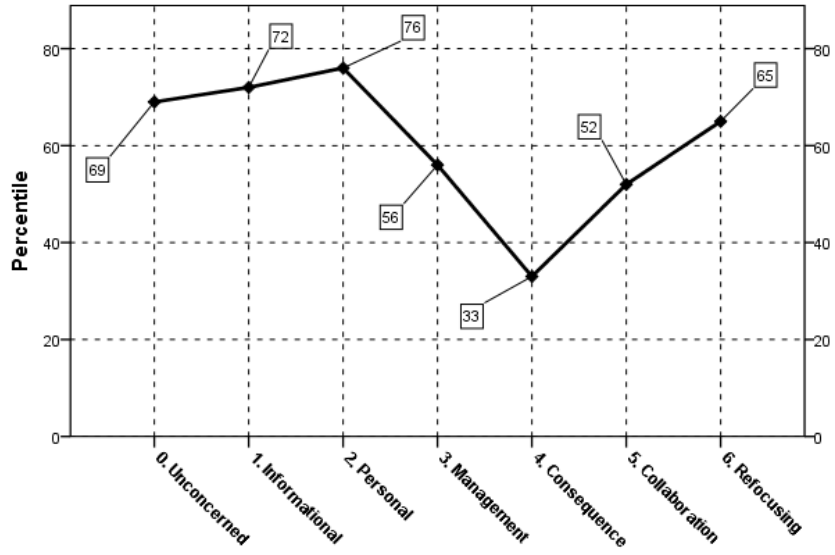
Stage	*C.α.C	Stage	*C.α.C	Stage	*C.α.C
Stage 0	.588	Stage 3	.754	Stage 5	.896
Stage 1	.812	Stage 4	.878	Stage 6	.855
Stage 2	.891				

Results

Teachers' Overall Stages of Concern Profile

The teachers' overall SoC profile (Figure 1) showed, at first sight, that the first three stages (unconcerned, informational, and personal), were the highest stages. Among these three stages, the personal stage had the highest percentile (76th), followed by the informational stage (72nd), and finally, the unconcerned stage (69th). In addition, the overall profile suggested that the lowest stage of concern was stage 4 (consequence), with a percentile score of 33rd. Moreover, medium intensities were recorded for stage 3 and stage 4 (56th and 52nd consecutively). Finally, a remarkable feature of this profile was the "tailing-up" of the refocusing stage (the 65th).

Figure 1
Teachers' Overall SoC Profile



Furthermore, the overall profile reflected only the average percentiles scores of the SoC questionnaire. Therefore, we could not infer from this profile the teachers' distribution according to their percentiles' frequency (for instance, through quartiles) as well as their distribution according to their highest stage of concern. Thus, for improved visibility of our results, Table 4 and the Box Plot (Figure 2) provide more details on these two later types of distribution.

Table 4

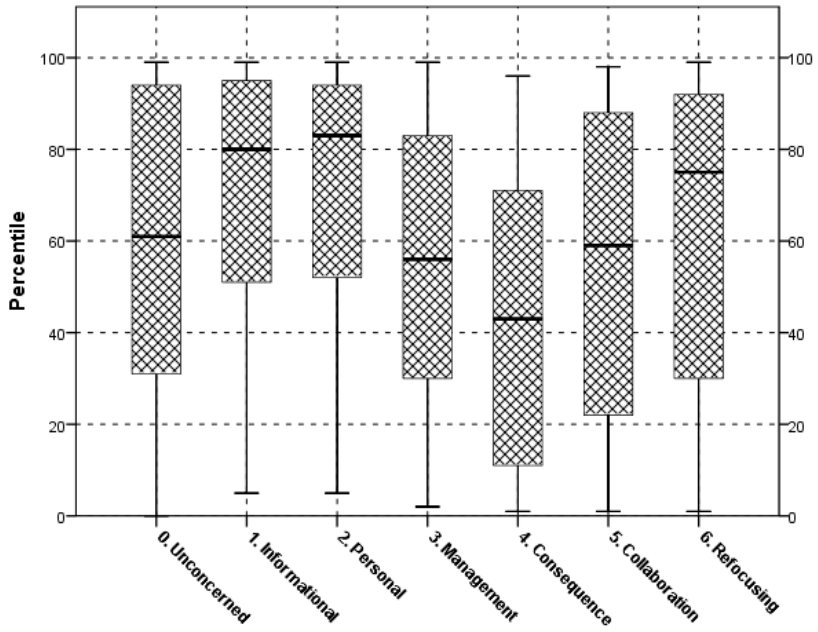
Distribution of Teachers' Highest Stage of Concern

	0	1	2	3	4	5	6	Total
n	106	119	91	24	4	22	69	438*
%	12.9	27.2	20.8	5.5	0.9	5	15.8	100

Note. * The highest percentile is replicated over two or more stages for some participants.

Figure 2

Distribution of Teachers by Percentile Frequency (Quartiles)



Relationship between Teachers' Stages of Concern and the Main Independent Variables

By using Student's *t*-test, our results highlighted statistically significant differences ($p<0.05$) in the teachers' concerns regarding ICT integration according to two variables, namely ICT training and the impact of the COVID-19 crisis on their attitude toward self-training in the field (Table 5). Hence, teachers who previously received training in ICT, regardless of its form or source, were more concerned about consequence, collaboration, and refocusing issues (Figure 3). Moreover, the results suggested that teachers who replied "Yes" to a question about the positive impact of the COVID-19 experience on their self-training efforts to improve their capability to integrate ICT meaningfully in their classrooms had more concerns in five of the seven stages of the questionnaire: Informational, Personal, Consequence, Collaboration, and Refocusing stages (Figure 4).

Furthermore, our statistical analysis using an one-way ANOVA test revealed a significant relationship ($p<0.05$) between the SoC and two other variables, namely participants' teaching

experience and their age (Table 6). Regarding teaching experience, there were statistically significant differences in the unconcerned, informational, personal, management, and collaboration stages. As for age, significant differences were recorded in the unconcerned, informational, personal, management, and consequence stages.

Table 5

Comparison of Teachers' SoC Means by ICT Training and COVID-19 Impact

Stages	ICT training	n	M	Sig. (*t*-test)	COVID-19 impact	n	M	Sig. (*t*-test)
Stage 0	Yes	214	11.88	.241	Yes	312	12.14	.505
	No	168	12.73		No	70	12.76	
Stage 1	Yes	214	20.26	.731	Yes	312	20.91	.021*
	No	168	20.58		No	70	18.14	
Stage 2	Yes	214	21.67	.653	Yes	312	22.12	.009*
	No	168	21.20		No	70	18.56	
Stage 3	Yes	214	15.12	.369	Yes	312	15.59	.615
	No	168	15.93		No	70	14.97	
Stage 4	Yes	214	22.39	.005*	Yes	312	22.05	.000*
	No	168	19.49		No	70	16.96	
Stage 5	Yes	214	22.68	.001*	Yes	312	22.21	.000*
	No	168	18.93		No	70	15.77	
Stage 6	Yes	214	21.72	.000*	Yes	312	21.09	.000*
	No	168	17.85		No	70	15.24	

Figure 3

Teachers' SoC by Previous ICT Training

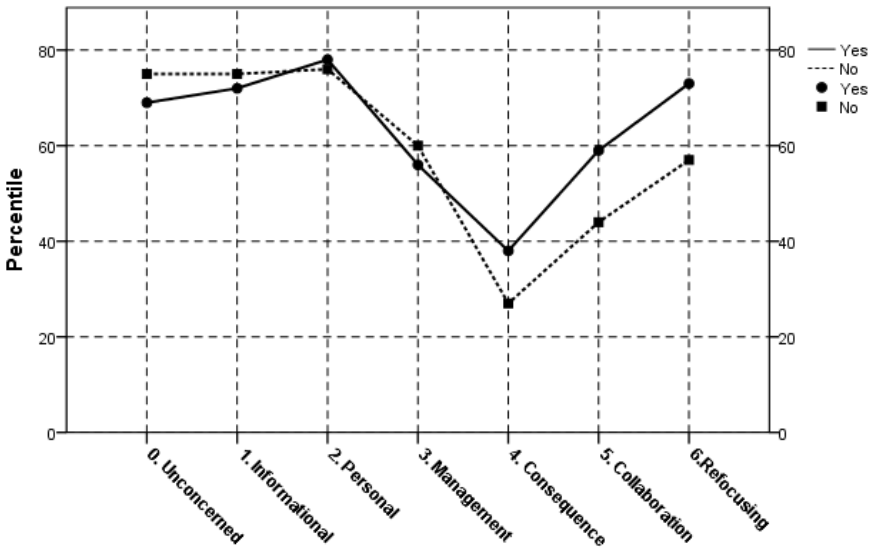


Figure 4

Teachers' SoC by the Impact of the COVID-19 on their Self-training Efforts

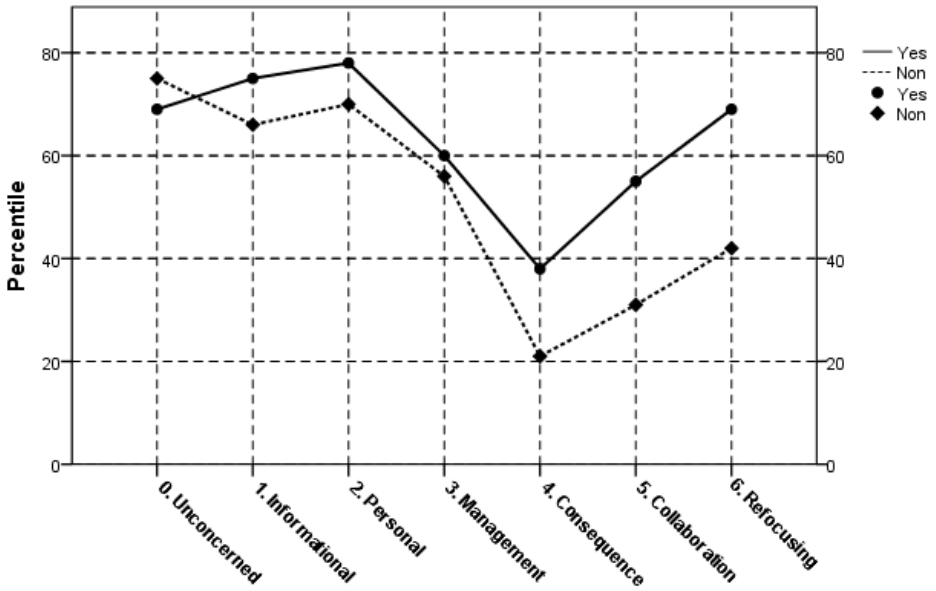


Table 6
Comparison of Teachers' SoC Means by Teaching Experience and Age

Teaching Experience			Age		
Stages	**F**	**Sig.**	**Stages**	**F**	**Sig.**
Stage 0	5.328	.001*	Stage 0	4.478	.004*
Stage 1	3.934	.009*	Stage 1	3.069	.028*
Stage 2	3.789	.011*	Stage 2	3.169	.024*
Stage 3	4.110	.007*	Stage 3	3.654	.013*
Stage 4	2.424	.065	Stage 4	2.866	.037*
Stage 5	2.884	.036*	Stage 5	2.085	.102
Stage 6	1.937	.123	Stage 6	1.887	.131

Moreover, for an in-depth analysis of the results arising from the ANOVA test, a Post Hoc test (the Least Significant Difference test) was carried out. Thus, without reporting detailed statistics, the general conclusion highlighted for the teaching experience variable was that the more teaching experience, the less concerned the teachers were, especially for the two extreme groups (1-5 years and over 26). Although the ANOVA test did not reveal significant differences for the consequence and refocusing stages, the Post Hoc test did between the extreme age groups. This conclusion is well illustrated in Figure 5. In addition, the Post Hoc test results suggested a similar trend regarding the age variable. That is, the younger the teachers, the higher the intensity of concerns (Figure 6). Differences were significant for extreme age groups (20-30 and "51 and over") over all SoC, including the collaboration and the refocusing stages, where the ANOVA test *p*-value was not significant.

It is noteworthy that no significant differences were suggested for the other independent variables, namely gender, teaching level, workplace, school subject, and diploma.

Figure 5

Teachers' SoC by Teaching Experience

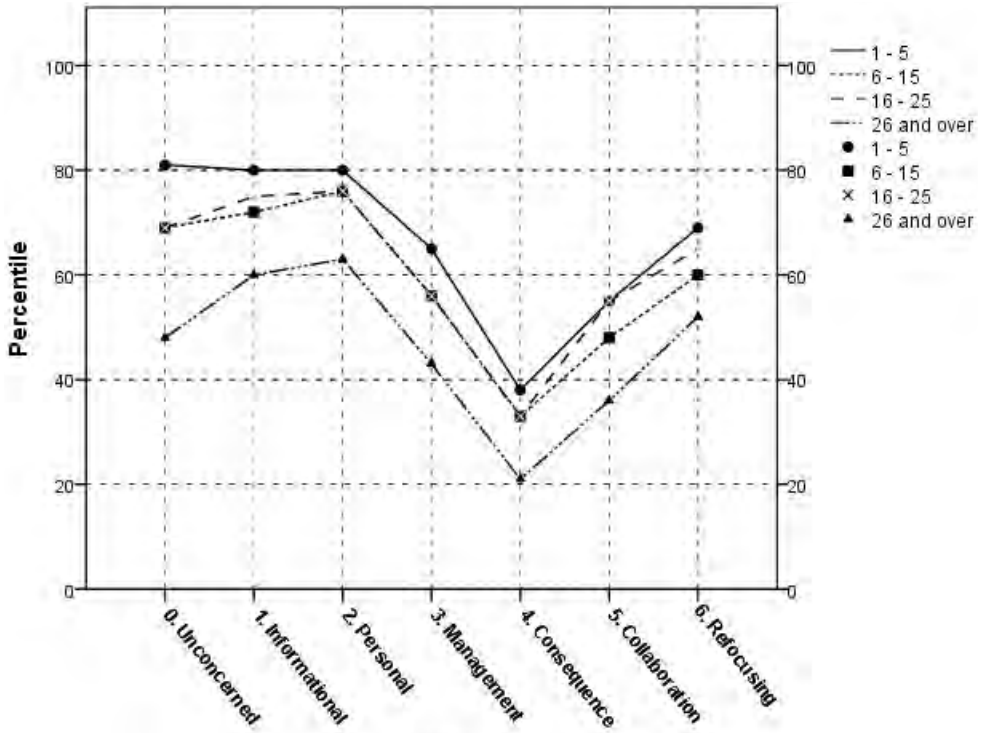
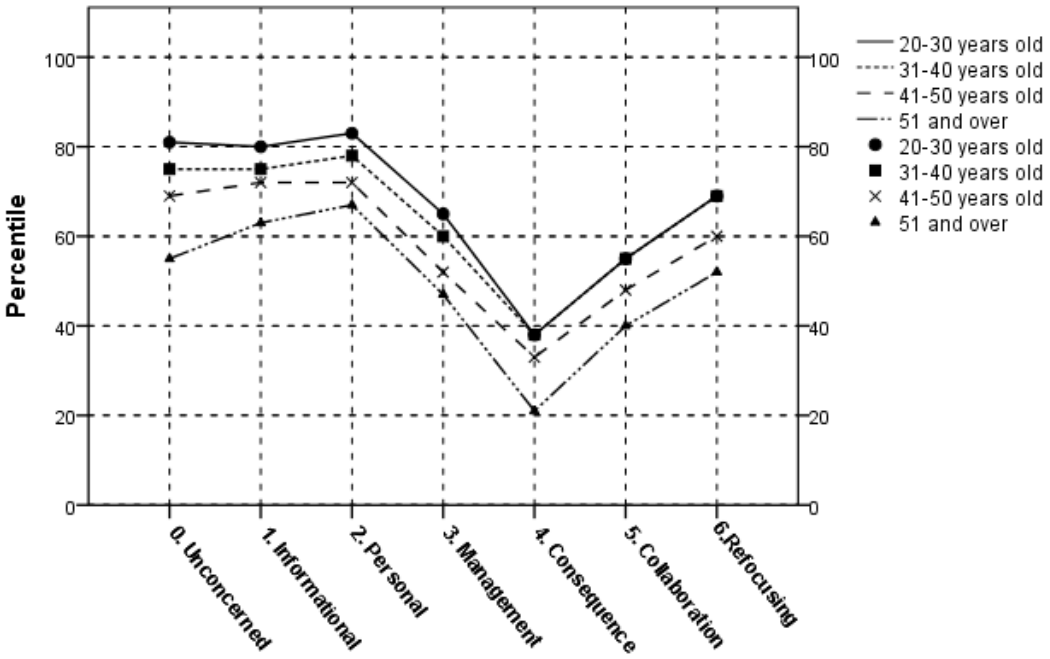


Figure 6

Teachers' SoC by Age



Discussion

In the present study, we attempted to explore Moroccan teachers' concerns about ICT integration in their teaching practices (Objective 1). In addition, we examined whether these concerns were sensitive to continuous training in the field and the experience of teaching amid the COVID-19 crisis (Objective 2).

To interpret the teachers' overall profile of concerns illustrated in our findings (Figure 1), we refer to the guidelines recommended by George et al. (2013). This profile showed high percentile scores for the three first SoC, that is, stage 2 (76th), stage 1 (72nd), and stage 0 (69th). First, the participants' high personal percentile score suggests they were more concerned about self-issues like professional status, promotions, and personal privileges. In other words, they were most concerned about how ICT might impact them. Second, the high informational percentile score shows, in turn, that the participants were curious about the features and requirements of ICT integration. Participants with high informational stage scores were not bound to be knowledgeable, but they were rather curious people who wanted to know more. The high stage 1 and stage 2 scores find their explanation in other studies, combining them into one stage because of their strong correlation (Bailey & Palsha, 1992; Cheung et al., 2001; Shotsberger & Crawford, 1999). Likewise, many other studies found high and close stage 1 and 2 scores (Alnujaidi, 2021; Ashrafzadeh & Sayadian, 2015; Dubey, 2016; Gu et al., 2023; Masarweh, 2019; Yang-Hsueh & Syh-Jong, 2014). Moreover, the fact that the personal stage score is higher than the informational stage score would indicate a potential resistance toward ICT integration. Third, the participants' high unconcerned stage scores indicated that the integration of ICT was not a priority for the participants. They were not interested in using ICT; they would be more engaged in other activities or tasks. In sum, high scores in the three first stages generally characterized the non-user profile.

Furthermore, the lowest consequence stage score (33rd) indicated that the participants were less concerned about the effect of their ICT use on their learners. It is an alarming finding for the Ministry of Education, which had placed the learner at the center of the new reform's actions (The Ministry of National Education, 2022). Likewise, the consequence stage score was the lowest in other studies (Alnujaidi, 2021; Ashrafzadeh & Sayadian, 2015; Dele-Ajayi et al., 2021; Dubey, 2016; Georgiou & Ioannou, 2019). Nevertheless, in Sarfo et al.'s (2017) study, consequence concerns about integration ICT had the second highest score. In addition, our findings suggest medium scores in the management and collaboration stages. These findings indicate a relative interest in managerial issues, like logistics and time, and in collaborating with others. Hence, From the previous analysis of the first six stages, we could infer that the typical profile of our sample was that of a non-user. Additionally, the tailing up of the refocusing stage score highlighted valuable information about teachers' typical profile; despite having innovative ideas, teachers were reluctant to integrate ICT. Thus, this tailing up emphasized the hypothesis, raised previously, of the participants' resistance toward ICT integration, and it "[…] should be heeded as an alarm" (George et al., 2013, p. 42). Being able to use ICT is necessary, but it is not a condition for effectively integrating them (Sandholtz & Reilly, 2004). Dubey (2016) found an overall profile shape close to ours.

Regarding continuous training in ICT, our findings suggest that teachers who have previously received such training have significantly higher impact-concerns than teachers who have not. Adams (2002) found positive correlations between training in ICT and impact-concerns. In addition, most studies that have addressed professional development in a particular technology found shifts from self-concerns to impact-concerns at the end of this professional development (Alnujaidi, 2021; Kayaduman & Demirel, 2019; Vaughan, 2002); the professional development mitigates participants' self-concerns and accentuates their impact-concerns. In our study, the absence of significant differences in self-concerns could be explained by the wide range of technologies that the acronym ICT refers to as innovation. That is, participants need more information about technologies and about how they can affect them. On the other hand, lecturing about a particular technology within a professional development program provides answers to participants' questions about their self-concerns. Furthermore, participants who think the COVID-19 experience raised their self-training efforts regarding ICT integration have significantly high informational, personal, consequence, collaboration, and refocusing concerns. That is, this experience aroused their curiosity about ICT and made their practices more sophisticated. The COVID-19 experience has positively impacted teachers' attitudes about using ICT (Baytar et al., 2022). Furthermore, our findings suggested significant differences in teachers' SoC regarding teaching experience and age. Recent hires and young participants were more concerned than experienced and older teachers. Adams (2002, p. 285) inferred that "[…] young faculty and faculty with less teaching experience expressed higher-order concerns". In contrast, more experienced and older teachers had deeper concerns over most of the stages in other studies (Alnujaidi, 2021; Dele-Ajayi et al., 2021).

Conclusion

The ongoing advance of technology, as well as its significant contribution to ensuring pedagogical continuity during the COVID-19 crisis, would explain the outstanding presence of ICT integration in education in the current scientific research. The researchers have addressed the teachers' ICT integration from many perspectives to examine how they use technology to improve their teaching. In the same context, our study adopted a quantitative approach to examine Moroccan teachers' concerns about using technology.

Hence, our finding suggested that the teachers' overall SoC profile is that of "reluctant" non-users. This profile showed high percentiles for the first three SoC, a low consequence stage percentile, medium percentiles for stages 3 and 5, and a tailing up at the refocusing stage. Moreover, the findings highlighted a positive relationship between teachers' concerns about integrating ICT and continuous training in technology on the one hand and the pandemic impact on their attitudes toward self-training on the other. In addition, our results showed significant differences in teachers' concerns regarding teaching experience and age.

Furthermore, the results of this paper do not claim exhaustiveness. We are aware of the limits of our approach related chiefly to our sample's non-representativity of the entire schools of the country and the risk of getting subjective responses from using a self-perception instrument. However, we think that our findings propose a theoretically framed diagnosis that could help

policymakers obtain answers to some questions related to the integration of technology in Moroccan public schools, especially as the study takes place in a context where the Ministry of Education is initiating its efforts to implement the twelve commitments of the Roadmap 2022-2026. Moreover, as further research, our study's approach would be used to understand teachers' concerns about particular technologies' implementation with a limited number of participants to address not only the overall profile of concerns but also look into every participant's concerns to design subsequently appropriate interventions according to the individuals' needs. In addition, for a successful implementation of change, the concerns of change leaders need to be addressed as well.

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