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Teaching Styles of Teacher Educators and Their Use of ICT

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Abstract

Two main types of teaching styles can be distinguished: a traditional teacher-centred style focussing on transfer of knowledge by teachers, and a more student-centred and innovative teaching style aiming at construction of knowledge by students. The main emphasis on the use of ICT in secondary education is on transfer of knowledge. Some authors point at teacher training not being able to sufficiently prepare future teachers for them to incorporate ICT in their teaching. In the present study, teaching styles of teacher educators, both without and with the use of ICT, have been studied by means of a web survey. Participants were 262 teacher educators from 12 teacher training institutes in the Netherlands. The study showed that, when using ICT, there is more emphasis on knowledge construction, as compared to knowledge transfer. Several variables have been identified that are linked to the teacher educators' teaching styles, including teacher educators' views on modelling learning environments and on their students' abilities at autonomous and co-operative learning, the self-assessment of their competencies in using ICT as a pedagogical aid, subject area, and the encouragement by management to use ICT in education.

Keywords: *Teacher training; ICT; teaching styles*

The teacher is a crucial factor in the process of using information and communication technology (ICT) in the classroom (Ertmer, 1999). In primary and secondary education, teachers in general may decide for themselves whether or not to use ICT in classroom practice (Kennewell, Parkinson, & Tanner, 2000). Teachers have to see the advantages of ICT in order to be motivated to implement it in their teaching practice (Zhao & Cziko, 2001). In addition, teachers' pedagogical perspectives and their views on how ICT can contribute to the learning environment play an important role in their actual use of ICT in the classroom (Higgins & Moseley, 2001; Hokanson & Hooper, 2001; Mumtaz, 2000; Niederhauser & Stoddart, 2001).

ICT may fit into a spectrum of instructional approaches, varying from traditional to innovative (Stoddart & Niederhauser, 1993). Two main types of teaching styles can be distinguished: a traditional teacher-centred style aiming at transfer of knowledge, and a more student-centred and innovative style aimed at construction of knowledge by students. The use of ICT applications of a skill-based nature fits into traditional approaches to teaching and learning, whereas the use of open-ended applications fits

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into a constructivist approach (Niederhauser & Stoddart, 2001; Smeets, 2005). Many studies have shown that traditional ways of using ICT, mainly of a skills-based nature, are favoured by many teachers (Niederhauser & Stoddart, 2001; Smeets & Mooij, 2001; Smeets, 2005; Tondeur, Van Braak, & Valcke, 2007). ICT is largely being used in ways that support existing teaching practices (Hayes, 2007). Whether or not ICT applications of a more student-centred open-ended nature are used depends to a large extent on teachers' decisions. In this respect, teachers' pedagogical perspectives and their views on how ICT can contribute to the learning environment play an important role (Becta, 2004; Higgins & Moseley, 2001; Hokanson & Hooper, 2001; Niederhauser & Stoddart, 2001). Research shows that teachers who adhere to traditional transfer approaches to instruction, tend to prefer skill-based software, whereas most teachers who support constructivist views of teaching and learning use skill-based as well as open-ended software (Niederhauser & Stoddart, 2001). Moreover, constructivist beliefs of teachers have shown to have a positive effect on the use of computers in the classroom, whereas traditional beliefs have a negative impact on computer use (Hermans, Tondeur, Van Braak, & Valcke, 2008). Both experience with computer technology and attitudes toward technology in the classroom have proved to be important variables that predict differences between teachers who successfully integrate computer technology from those who do not (Mueller, Wood, Willoughby, Ross, & Specht, 2008).

According to several authors, the influence of teacher education on teachers' actual behaviour in schools appears to be limited. Various explanations are given for this conclusion. One of the most influential explanations refers to the so-called socialization process. Teacher behaviour is to a large extent influenced by the school context, since teachers acquire the values, attitudes and interests of the groups they are becoming a member of. This process is counteracting the evolving of innovative teaching approaches (Brouwer & Korthagen, 2005). However, in a longitudinal study that was carried out by Brouwer and Korthagen (2005), the competence development of teachers proved to be influenced not only by the school contexts of the schools at which these teachers taught, but also by the pre-service teacher education programmes from which these teachers had graduated. The authors concluded that teacher education can make a difference in terms of the actual teaching behaviour of graduates from pre-service teacher education.

Therefore, with respect to the use of ICT in the classroom and the way in which ICT is incorporated into various teaching styles, it is interesting to focus on the teaching styles and the use of ICT by teacher educators in pre-service teacher education.

In the present study, the following research questions have been addressed:

- What are teacher educators' views on desirable components of the learning environment and on their students' abilities at autonomous and co-operative learning?
- How can teaching styles of teacher educators without and with the use of ICT be characterized?

- What factors are linked to the use of ICT for transfer of knowledge and the use of ICT for fostering the construction of knowledge by students?

METHOD

A web survey has been carried out in order to gather data to answer the research questions. Data were collected in November 2009. Twelve pre-service teacher education institutes in the Netherlands participated in the study, mostly higher vocational education colleges. One year earlier a pilot study had been carried out at one teacher education institute. As a result of the data obtained from the pilot study, small alterations have been carried through in the questionnaire. Teacher educators were invited by a contact at their institute to complete the web questionnaire. Access to the questionnaire was provided via unique user identification codes with which the teacher educators had been provided.

The questionnaire included questions about the teacher educators' background characteristics, the use of ICT in their classes, their views with respect to the modelling of learning environments, their views on their students' capabilities at autonomous and co-operative learning, their self-assessments on their competencies with respect to the use of ICT in education, their teaching styles, and the extent to which the management of their institutes encourages the use of ICT in education. Apart from the items that addressed background characteristics, most of the questionnaire consisted of Likert items.

Participants

Data are available from 262 teacher educators, of whom 165 are male (63 per cent) and 97 are female (37 per cent). Teacher educators spending less than 4 hours per week on teaching, and teacher educators who only processed part of the questionnaire have been excluded from the data set. The large majority of teacher educators were employed by a higher vocational teacher education institute. About 7 per cent of subjects were employed by a university pre-service teacher education unit. Most of the teacher educators were working in the field of secondary-education pre-service teacher training (95 per cent), whereas 5 per cent were teaching in primary-school pre-service teacher training. Four subject areas were distinguished: language studies (63 teacher educators), science / technical studies (69 teacher educators), social studies (59 teacher educators), and pedagogy (41 teacher educators). In addition, there were 30 participants from several other subject areas.

Data Analyses

For the Likert items, alpha-scale build-up was carried out by means of factor analyses and reliability analyses. Cronbach alpha coefficients were calculated for the respective item groups. Subsequently, mean scores per scale were calculated. The alpha coefficients are presented in the respective tables. In order to assess the influence of background variables on the teacher educators' pedagogical practices, Pearson

correlations were calculated, and analyses of variance and multiple regression analyses were carried out.

RESULTS

Background variables

The average age in years of the teacher educators was 47.8, with a standard deviation of 10.1. The average number of teaching hours per week was 15.1, with a standard deviation of 10.2. On average, these teacher educators used ICT during their classes for 6.3 hours per week, with a standard deviation of 5.6. The use of ICT during classes as a percentage of teaching hours ranged from 0 to 100, the average being 46.1, and the standard deviation being 31.5.

Teacher educators' competencies in ICT use

The teacher educators were asked to rate their competencies in the use of ICT as a pedagogical aid during classes on a scale from 1 ('not competent at all') to 4 ('very advanced'). The majority rated their competency in this respect as basic (42 per cent) or advanced (48 per cent). A small minority of 2 per cent felt they were not competent at all at this point, and 9 per cent felt their competency was very advanced. The average rating was 2.63, with a standard deviation of .67.

Teacher educators' views

One of the aims of the web questionnaire was to assess the teacher educators' preferences with regard to the way in which learning environments should be modelled in order to foster learning. In addition, it explored the teacher educators' views on their students' abilities at autonomous and co-operative learning.

The teacher educators were presented with ten aspects of learning environments. For each of these aspects they were asked to rate the desirability of being included in the learning environment. According to the opinion of over 90 per cent of teacher educators, students should have access to many information resources, they should work together co-operatively, and they should develop teaching materials themselves. Between 80 and 90 per cent felt that students should reflect on the growth of their competencies, they should be enabled to use multimedia, and they should be enabled to experiment (see Table 1).

Table 1
Teacher educators' views on desirable components of learning environments

	Disagree completely	**Quite disagree**	**Do not disagree and do not agree**	**Quite agree**	**Agree completely**
Learning materials should contain a large visual component	2%	7%	21%	47%	23%
Students should be enabled to use multimedia	2%	1%	10%	34%	53%
Students should work together co-operatively	2%	3%	5%	35%	56%
Students should be enabled to access the internet at any time	7%	13%	26%	36%	17%
Games and adventures should be included in the learning materials	18%	31%	36%	11%	4%
Students should have access to many information resources	2%	---	4%	31%	62%
Students should be enabled to experiment	2%	2%	10%	46%	41%
Students should be enabled to choose subjects that match their interests	3%	6%	21%	48%	23%
Students should reflect on the growth of their competencies	2%	3%	7%	31%	58%
Students should develop teaching materials themselves	2%	---	7%	28%	63%

Cronbach alpha=.86; Likert scale (1='disagree completely'; 5='agree completely'); Mean=4.00; Standard deviation=.60; N=262

In general, teacher educators were moderately optimistic about their students' abilities at autonomous and co-operative learning. A majority of teacher educators felt that their students were well able to carry out learning tasks autonomously, and 50 per cent felt that their students were well able to work together co-operatively. The opinions about the students' ability to solve complex problems and to perform discovery learning, however, were less favourable. Just over 25 per cent felt that students are only to some extent able to solve complex problems, and just under 25 per cent felt that their students were only to some extent able to perform discovery learning (see Table 2).

Table 2
Teacher educators' views on their students' abilities at autonomous and co-operative learning

	Hardly	To some extent	Fairly	Well	Very well
Carrying out learning tasks autonomously	---	7%	43%	47%	3%
Planning their own activities	2%	16%	58%	23%	1%
Working together co-operatively	---	3%	35%	60%	2%
Solving complex problems	1%	27%	52%	19%	2%
Discovering connections themselves	1%	18%	57%	23%	2%
Performing discovery learning	1%	21%	53%	25%	1%
Reflecting on their learning processes	---	11%	51%	35%	3%

Cronbach alpha=.87; Likert scale (1='hardly'; 5='very well'); Mean=3.20; Standard deviation=.52; N=262

Stimulating measures with respect to the use of ICT

Five items in the questionnaire addressed the extent to which, according to the teacher educators, management encourages the use of ICT in classes in pre-service teacher education. A majority of teacher educators felt that the use of ICT does not get much encouragement from management at their institute. Some opportunities seem to be provided to experiment with ICT, but there is not much encouragement to co-ordinate the use of ICT in the various sections or to discuss experiences with ICT in education. Apart from this, professional development with respect to the use of ICT in education does not get high priority in most institutes (see Table 3).

Table 3
The extent to which the use of ICT in education is encouraged by management, according to the teacher educators

	Never	Sometimes	Quite often	Often	Very often
Management encourages teachers to use ICT in their classes	11%	41%	28%	16%	4%
Management provides opportunities to experiment with ICT	9%	28%	28%	28%	7%
Management encourages teachers to discuss their experiences with ICT in education	15%	48%	16%	17%	4%
Management encourages co-ordination of the use of ICT in education in the various sections	30%	42%	18%	8%	2%
Management encourages professional development with respect to the use of ICT in education	15%	51%	19%	12%	3%

Cronbach alpha=.88; Likert scale (1='never'; 5='very often'); Mean=2.50; Standard deviation=.84; N=258

Teaching styles

The main focus of the web questionnaire was on teacher educators' teaching styles, in particular when they do and do not use ICT in classes. The questions resulted in four scales: knowledge transfer without ICT, knowledge construction without ICT, knowledge transfer with ICT, and knowledge construction with ICT.

Table 4 shows the results for teaching styles without using ICT. Five items addressed teaching styles focussing on knowledge transfer. Activities mentioned most frequently include asking questions about the learning contents that the students have studied, summarizing learning contents during classes, and explaining main points and difficult parts of new learning contents in advance. Seven items focussed on knowledge construction. The two activities applied most frequently are asking students to provide examples and materials from everyday practice, and stimulating students to set learning goals themselves.

Table 4
Teaching styles of teacher educators: knowledge transfer and knowledge construction without ICT

	Never / hardly ever	**Some-times**	**Quite often**	**Often**	**Very often**
Knowledge transfer					
I ask questions about the learning contents my students have studied	1%	11%	17%	36%	35%
I summarize learning contents during my classes	---	11%	25%	38%	26%
I explain main points and difficult parts of new learning contents in advance	2%	8%	24%	43%	23%
I check whether my students have mastered the learning contents that have been presented to them	1%	18%	33%	36%	13%
Books are the main source of knowledge for my students	1%	21%	42%	28%	9%
Knowledge construction					
I ask my students to provide examples and materials from all day practice	1%	20%	29%	35%	16%
I encourage my students to set learning goals themselves	1%	19%	35%	30%	16%
I encourage my students to provide feedback to each other about their work	4%	27%	28%	31%	10%
When I am assessing the students' work I also take the process and their approach into account	8%	26%	26%	29%	12%
I encourage my students to carry out research or projects themselves	4%	27%	25%	34%	10%

Table 4 (Continued)

	Never / hardly ever	Sometimes	Quite often	Often	Very often
In my classes students carry out assignments that match their interests	---	25%	40%	28%	7%
My students are free to choose learning contents themselves	17%	46%	21%	13%	3%

Knowledge transfer without ICT: Cronbach alpha=.68; Likert scale (1='never / hardly ever'; 5='very often'); Mean=3.63; Standard deviation=.64; N=262
Knowledge construction without ICT: Cronbach alpha=.83; Likert scale (1='never / hardly ever'; 5='very often'); Mean=3.12; Standard deviation=.72; N=262

Teaching styles when ICT is applied in classes were addressed in seven items. Results are presented in Table 5. The main conclusion is that the activities presented are not being used very frequently by these teacher educators. When ICT is used, there is more focus on the construction of knowledge (with an average of 2.75 on a scale from 1 to 5), and less focus on transfer of knowledge (with an average of 2.0 on a scale from 1 to 5). Of the teaching activities included, encouraging students to look for current sources via the internet is applied most frequently: 45 per cent of teacher educators ask their students to do this often or very often.

Table 5
Teaching styles of teacher educators: knowledge transfer and knowledge construction with ICT

	Never / hardly ever	Sometimes	Quite often	Often	Very often
Knowledge transfer with ICT					
I have my students test their mastery of the learning contents by computer	54%	29%	10%	7%	1%
I have my students practice learning contents by using the computer	39%	34%	14%	10%	2%
I have my students use subject-specific educational software	25%	40%	15%	15%	5%
Knowledge construction with ICT					
I encourage my students to look for current sources via the internet	4%	21%	30%	33%	12%
My students carry out assignments co-operatively with the use of internet resources like e-mail, MSN, Skype or the electronic learning environment	17%	29%	28%	17%	10%
I give assignments and then my students look for answers via the internet	16%	46%	21%	14%	3%
I encourage my students to use ICT for co-operative learning	17%	37%	25%	16%	5%

Knowledge transfer with ICT: Cronbach alpha=.75; Likert scale (1='never / hardly ever'; 5='very often'); Mean=2.03; Standard deviation=.86; N=260
Knowledge construction with ICT: Cronbach alpha=.80; Likert scale (1='never / hardly ever'; 5='very often'); Mean=2.75; Standard deviation=.86; N=260

Some significant differences in teaching styles occurred between subject areas (see Figure 1). Analyses of variance showed significant results with respect to knowledge transfer without ICT ($F=3.87$, $p<.005$), knowledge construction without ICT ($F=6.18$, $p<.001$), and knowledge transfer with ICT ($F=7.89$, $p<.001$). No significant differences between subject areas were noted as far as knowledge construction with ICT was concerned.

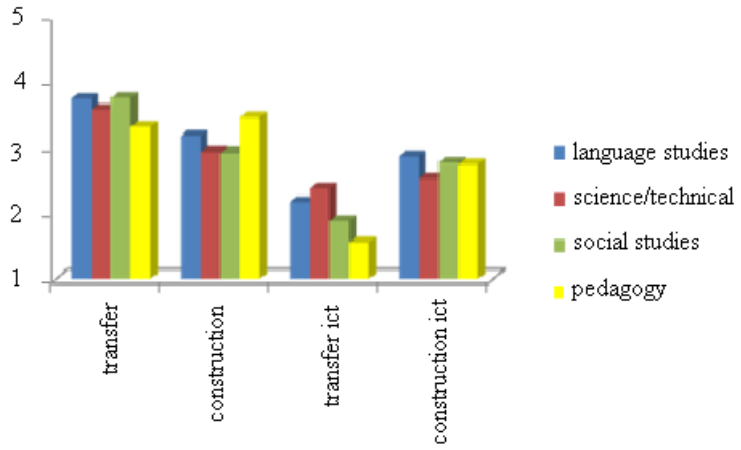

Figure 1.Teaching Styles of Teacher Educators by Subject Area

There was less focus on knowledge transfer by teacher educators in the subject area of pedagogy, as compared to teacher educators in other subject areas. In contrast, teacher educators in the pedagogy area did focus more on the construction of knowledge. The conclusion that was drawn with respect to knowledge transfer without ICT also applied to the use of ICT for transfer of knowledge. The pedagogy department showed little use of ICT to support knowledge transfer. In the subject area of science and technical studies, the use of ICT for transfer of knowledge reported by teacher educators was comparatively high.

Factors that influence the use of ICT for transfer or construction of knowledge

The three scales addressing teacher educators' views on desirable components of learning environments, their views on the students' abilities at autonomous and co-operative learning, and the extent to which management encourages the use of ICT in education were entered into multiple regression analyses. In addition, the teacher educators' self-assessment of their competencies in the use of ICT as a pedagogical aid (one single variable), and four dummy variables representing the subject areas were included in the analyses. The dependent variables in the analyses were the extent of use of ICT for transfer of knowledge and the extent of use of ICT to construct knowledge, respectively.

The variables described above explained 22.7 per cent of variance in the use of ICT for transfer of knowledge (see Table 6). The teacher educators' self-assessment of their competencies in the use of ICT as a pedagogical aid contributed most to this result. Teacher educators feeling more confident about using ICT as a pedagogical aid are more inclined to use ICT for knowledge transfer in their classes. Subject area also contributed significantly, subjects from the science/technical and language studies areas showing more than average emphasis on the use of ICT for transfer of knowledge, and subjects in the area of pedagogy showing less. In addition, teacher educators' views on their students' abilities at autonomous and co-operative learning contributed significantly to the explanation of variance in the dependent variable. Teacher educators who feel more confident about their students' abilities in this respect, tend to apply ICT for knowledge construction more often in classes as compared to their colleagues who feel less confident at this point.

Table 6
Variables that are linked to the use of ICT for transfer of knowledge; results from a multiple regression analysis

	R^2 *total*	*B*	*SE*	β	*p*
Intercept		-.047	.331		
Competencies in the use of ICT as a pedagogical aid during classes	.089	.287	.074	.222	.000
Subject area: Pedagogy	.134	-.301	.147	-.127	.041
Views on students' abilities at autonomous and co-operative learning	.181	.364	.094	.220	.000
Subject area: Science / technical	.206	.459	.125	.234	.000
Subject area: Language studies	.227	.333	.128	.166	.010

The views on the students' abilities at autonomous and co-operative learning proved to be the most important of the variables entered into the analysis as far as the use of ICT to construct knowledge was concerned (see Table 7). In addition, teacher educators' self-assessment of their competencies in the use of ICT as a pedagogical aid and their views on the aspects that should be incorporated in learning environments played a significant role. Teacher educators tended to use ICT for fostering knowledge construction in their classes more frequently, when they felt more confident about their students' abilities at autonomous and co-operative learning, and when they felt more confident about their own competencies in using ICT as a pedagogical aid. As far as the subject area was concerned, only the science/technical subject area showed a significant contribution to the explanation of the amount of use of ICT to construct knowledge. Teacher educators in this subject area were found to make less use of ICT for this purpose as compared to their colleagues from other departments or sections.

Encouragement of the use of ICT by management yielded a significant result also, contrary to the outcomes with regard to the use of ICT for the transfer of knowledge, where encouragement by management did not contribute significantly.

Table 7
Variables that are linked to the use of ICT to construct knowledge; results from a multiple regression analysis

	R^2 *total*	*B*	*SE*	β	*p*
Intercept		-.689	.419		
Views on students' abilities at autonomous and co-operative learning	.118	.412	.092	.250	.000
Competencies in the use of ICT as a pedagogical aid during classes	.179	.300	.073	.233	.000
Views on ways of fostering teaching and learning	.219	.252	.079	.174	.002
Subject area: Science / technical	.248	-.354	.106	-.181	.001
Encouragement of ICT use by management	.272	.162	.057	.158	.005

CONCLUSION & DISCUSSION

Three main questions have been addressed in the present study. The first question relates to teacher educators' views on teaching and learning. In general, the teacher educators showed quite favourable views towards including aspects in learning environments that can be characterised as representing a constructivist approach to learning. A large majority felt that students should have access to many information resources, should work together co-operatively, should develop teaching materials themselves, should reflect on the growth of their competencies, should be enabled to use multimedia, and should be enabled to experiment. Teacher educators were moderately optimistic about their students' abilities at autonomous and co-operative learning. A majority of teacher educators took the view that the students were well able to carry out learning tasks autonomously and 50 per cent felt that their students were well able to work together co-operatively. However, teacher educators were not very optimistic about their students being able to solve complex problems or to perform discovery learning.

The second question addressed the teaching styles of teacher educators, without and with the use of ICT, respectively. At this point some interesting differences arose. The focus of teaching styles when ICT was not part of the teaching/learning process was mainly on transfer of knowledge, and to a lesser extent on the construction of knowledge. However, when ICT was used, opposite results were found, with a focus on knowledge construction.

The third question related to factors that are linked to the use of ICT for transfer of knowledge and the use of ICT for fostering the construction of knowledge by students, respectively. Teacher educators on average proved to use ICT for the transfer of knowledge to a larger extent when they felt more competent in the use of ICT as a pedagogical aid, and when they felt more confident about their students' abilities at autonomous and co-operative learning. Teacher educators were inclined to use ICT to a larger extent for fostering the construction of knowledge when they felt more confident about their students' abilities at autonomous and co-operative learning, when they felt more confident about their own competencies in using ICT as a pedagogical aid, when they had more favourable attitudes towards modelling learning environments according to constructivist views, and when they felt more encouraged by the teacher training institute's management to use ICT in education. In addition to these findings, teaching styles when using ICT were in some respects significally linked to subject area, although focus in all four areas that were distinguished was on the use of ICT for fostering knowledge construction.

The present study showed that teacher educators in general have quite favourable views about modelling learning environments according to constructivist principles, and are inclined to use ICT for supporting the construction of knowledge by students to a larger extent than for the transfer of knowledge. Although several authors have found that the influence of teacher education on teachers' actual behaviour in schools is quite limited, Brouwer and Korthagen (2005) concluded that pre-service teacher education can make a difference in this respect. In another study, it was concluded that student teachers holding stronger constructivist teaching beliefs, strong teaching efficacy and computer self-efficacy, and more favourable attitudes towards the use of computers in education, are more interested in integrating the use of ICT in their future teaching practice (Sang, Valcke, Van Braak, & Tondeur, 2010). Therefore, the approach that is adopted by teacher educators may provide a stimulus to their students to apply more innovative ways of teaching with ICT, once these students have started teaching themselves.

According to Kirschner and Selinger (2003), in many ways students are light-years ahead of their teachers in terms of the possibilities of ICT, leading to students getting bored and frustrated. These authors stressed that inadequate teacher expertise is the bottleneck in the application of ICT in education. Guzman and Nussbaum (2009) contended that the use of technology is not integrated pedagogically in teacher training, and is thus not a source of inspiration for teachers' professional activities. In fact, a substantial group of teacher educators in the present study self-assessed their competence in using ICT as no more than basic. Therefore, it is recommended that more attention be paid to the teacher educators' competencies in this respect, all the more so as encouragement of the use of ICT by management proved to be linked to the use of ICT for fostering the construction of knowledge.

In 2007 a web survey was carried out among secondary-school teachers using a similar questionnaire as the one applied in the present study. It was concluded at the time that the main focus of ICT in secondary schools is on supporting transfer of

knowledge (Smeets, Van Gennip, & Marx, 2007). Further attention is needed for ways of linking pedagogical practice in pre-service teacher training to pedagogical practice in secondary education. Further studies should assess whether the influence of present teacher educators' use of ICT will in future lead to noticeable changes in secondary education.

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