"I can't fall behind!"—Aspirations, technology and becoming a teacher in South Africa

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ABSTRACT

This article contributes a theoretical perspective on aspirations and technology in ICT4D research. The paper draws on the results of a grounded theory study to examine the aspirations for professional development of undergraduate pre-service teachers in South Africa, and the extent to which these are marked by or influence the formation of technology attitudes. It is found that the relations between professional aspirations and attitudes towards technology are fairly complex, and of mutual determination: technology is seen as a capacity enabler, instrumental in helping pre-service teachers fulfil their professional aspirations, which in turn motivates them to understand and integrate technology in their future teaching. The implications of this argument for wider ICT4D scholarship are discussed. Second, the paper argues for the potential of grounded theory as a promising methodological approach for ICT4D research, when the aim is to reveal novel perspectives for the study of relations between technology and development, favouring a local viewpoint.

KEYWORDS: aspirations, pre-service teachers, technology attitudes, technology in education

CATEGORIES: K.3.1

1 INTRODUCTION

The increased availability of information and communication technologies (ICTs) in developing contexts generates expectations for personal and socio-economic development that are at times incommensurate with the benefits they actually bring. These expectations permeate socio-political discourses and policies [1], and serve to shape people's attitudes towards technology, often centred on hyperbolized and idealised views on the potential of technology [2] [3]. The concept of 'aspiration' has been brought to the forefront in the ICT for development (ICT4D) literature to shed light on how ICTs impact on people's actual and imagined trajectories for development. Most of the ICT4D literature on aspirations is driven by the questions: (How) does increased availability and mastery of ICT meet or expand people's aspirations? Further, (how) are these increased aspirations concretized in the achievement of developmental goals? The pitfall mostly emphasised in state-of-the-art literature is that technology lures, creates expectations and drives ambitions, yet often these are based on partial understandings and on an overestimation of technology potentials [2].

This article contributes a theoretical perspective on aspirations and technology in ICT4D research. The paper introduces a grounded theory study that examines the aspirations for professional development of undergraduate pre-service teachers in South Africa. The article sheds light on what lies behind pro-technology attitudes, and the extent to which professional aspirations are marked by or influence the formation of such attitudes. The questions addressed are:

- What is the perceived role of technology in relation to pre-service teachers' aspirations for professional development?
- What role do aspirations play in motivating them to improve their technological competences?

It is found that the relations between professional aspirations and attitudes towards technology are fairly complex, and of mutual determination: technology is seen as a capacity enabler, instrumental in helping pre-service teachers fulfil their professional aspirations, which in turn motivates them to understand and integrate ICT in their future teaching. The implications of this argument for wider ICT4D scholarship are discussed.

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2 BACKGROUND

2.1 Aspirations, technology and pathways to development

The analysis of aspirations appears important in development studies when shifting attention from the external conditions of poverty and inequality, such as the legislative and political infrastructure, to internal constraints, which individuals may manifest in their behaviour and economic choices [4]. It has been argued that there is an inextricable link between aspirations failure and the perpetuation of poverty [5] [6]. Simply stated, poverty kills dreams and hopes, and the lack of dreams and hopes halts action and proactivity, therefore closing a vicious circle. Poverty appears therefore to be both a cause and a result of failure in aspirations [6]. This argument has been formalised in several development economics theories and models that attempt to explain how aspirations form and evolve, and how they either reinforce or resolve problems of deprivation [4] [6].

ICT4D studies present a peculiar case in the developmental scholarship on aspirations, as they introduce a core variable other than the established aspects of poverty and development: the role of technology. There are several ways to look at relations between aspirations, technology, and development. First, technology can become an object of aspiration in itself. It can be perceived as a status-raising object, and therefore drive adoption and use on virtue of this belief. Second, technology can be perceived as a tool that can contribute more or less directly to life improvement and development. This can take the form of having devices or access to services that can improve participation and living conditions (e.g., information about sanitation, market prices, access to e-government services). Or it can be oriented towards 'becoming': a projection of a better self in a better future, a scenario in which technology plays an active part.

Several country-based studies indicate that technology can have indeed a positive effect on raising aspirations for development [2] [7] [8]. Yet, the same studies indicate several pitfalls with this increase in aspirations. One common pitfall is that in many instances aspirations take the form of desires and projections, driven by partial understandings and often hyperbolized perceptions of what technology can do. For instance, Pal et al. [3] describe how parents in Indian rural schools, often with low or no computer skills, build aspirations for their offspring's education and socio-economic ascendancy around the role of computers and computer education. Other studies indicate that, on the contrary, the perceived role of ICTs in improving the quality of life depends on what uses and potentials people have been exposed to. For example, a study conducted among rural communities in Uganda on the perceptions of the role of ICTs in improving quality of life, found that people only see in ICTs as much as their interactions with them afford [9]. The perceived benefits of ICT centred around enhancing social interaction and entertainment, and participants showed little awareness of the potential of ICTs in improving their quality of life for areas such as political freedom, participation, and economics.

These examples make clear that if we focus on aspirations alone, the relation with development through technology has a missing link: do these aspirations actually concretize in reaching development goals? Several authors propose that this missing link lies in building capabilities for making aspirations attainable [8] [10]. Capabilities may be defined drawing on Sen, as abilities to attain to certain functionings or achievements [11]. Or they may hint at abilities to construct opportune associations between desires and outcomes, means and ends. Appadurai [5] proposes the notion of aspirations as 'navigational capacities', implying the ability to navigate a complex web of social relations, norms, opportunities and constraints in order to attain one's goals.

Ray and Kuriyan [10] argue that this notion of aspirations, inclusive of a capability-building component, can be used as interim indicator of development. This argument marks an opening for moving the study of aspirations in ICT4D research towards deeper conceptual explorations. The study of aspirations appears particularly significant for ICT for education (ICT4E) studies, with respect to the integration and use of technology in under-resourced educational contexts. Studies conducted in countries such as India [3] and Brazil [12] suggest that aspirations are determining factors for the way ICTs are perceived and used in educational environments, and may drive the motivation to seek qualifications for technological competence [12]. Similar research on relations between technology and aspirations is scarce for the African continent. The present study is intended as a contribution to help fill this gap, and takes an inductive approach to reveal associations between aspirations, technology, and development in the South African teacher education context.

2.2 Education, technology and the developmental promise: The case of South Africa

South Africa's transition to a knowledge economy has been boosted by recent ICT investments in key domains, including education. The belief that ICTs allow novel learning opportunities and educational resources [13] has motivated an encouraging legislative infrastructure and the launch of several technology programs for education. An integrated approach was conceived, by which programs targeted improved access to digital technology, particularly in disadvantaged schools, coupled with enhancement of the e-literacy skills of educators and learners. Computer labs as well as mobile technologies have been piloted in the country [14].

Yet, studies assessing the efficacy of these programs find that disparities still exist, and ICTs were either absent or used inadequately especially in under-resourced schools [15]. It is in these under-resourced contexts that the alleged benefits of ICT are found to

depend on resources for technology maintenance and adequately trained educators [16]. In particular, teachers' competences, or lack thereof, appear to be among the most important factors affecting the constructive use of technology in education [17].

It is in this context that the project MELISSA (Measuring E-Learning Impact in primary Schools in South African disadvantaged areas) was conducted, to study the social factors that condition the acceptance and effective integration of ICTs in the teaching-learning experience. MELISSA was a three-year research partnership between the Università della Svizzera italiana (Switzerland), Cape Peninsula University of Technology (CPUT) and the University of Cape Town (UCT) in South Africa. The project involved disadvantaged schools and educators in the Western Cape Province of South Africa. One of the project findings was the need for teacher training in ICT. Given challenges with providing meaningful, solid training to in-service teachers [18] it was hypothesized that training efforts could yield better results by focusing on pre-service teachers (PSTs).

3 METHODOLOGY

With this background, a project extension (MELISSA-X) set out to understand attitudes towards technology and its use in education among pre-service teachers, and the training needs associated with these attitudes. The project was structured around the offering of ICT training to pre-service teachers in two Western Cape universities (from now on, UNI-1 and UNI-2). The instructional design goal was to strengthen pre-service teachers' competences for the effective and creative use of technology in education. The research goals were to investigate changes in PSTs' attitudes towards technology and their perceived technological and teacher self-efficacy [17], and identify relations among these changes and the build-up of technological competence through the trainings. To this purpose, a 2-year study was devised, employing a mixed-methods approach that was designed to go from a predominantly quantitative approach in the first year, to an in-depth qualitative analysis during the second year.

3.1 ICT training

In the first year, the training module focused on the use of interactive whiteboards (IWB) to support teaching and class engagement activities. Overall, 233 first year students were involved in the training. At UNI-1, the training module was integrated in the institutional program and thus compulsory for students. It involved 190 participants, with a balanced population of Afrikaans and English-speaking students, and with different subject areas and teaching levels. In UNI-2, participation in the IWB training was voluntary. 43 PSTs attended the course, all Afrikaans-speaking and representing different subject areas and teaching levels.

In its second year, the study specifically involved a smaller group of highly motivated participants to run an in-depth qualitative analysis on the evolution of individual attitudes toward the creative use of technology in education during and after an intensive exposure and training on ICTs. In this phase, the training aimed to make participants aware of the possibilities of using digital technologies creatively in their teaching. The training was focused on digital storytelling (DST), which has been increasingly recognized as an educational practice with high potential for facilitating new forms of teaching and learning [19]. The training was voluntary for both institutions. The students, now in their second year, were informed about the project continuation. Those interested to continue the training were asked to submit an expression of interest explaining their reasons for wanting to partake further. Due to the nature of the training and investigation, a limited number of students could be selected, who were provided with laptops for use during the training. Participants' selection was done with a view to ensure the participation of very motivated students, and ensure a balanced representation in terms of ethnic and social background and teaching area specialisation. Selected students included nine females and two males, which reflected the predominantly female gender ratio in the applications received. With respect to age, all participants were aged below 20, except one female student aged 35–40. All participants were computer literate and represented different subject areas and teaching levels, including Foundation Phase (FP), Intermediate and Senior Phase (ISP) and Further Education and Training (FET). In terms of ethnicity, five of the participants were of white background, and six were coloured. Furthermore, participants came from very different social backgrounds, including small fishermen towns, villages, and large cities such as Cape Town.

The DST training course was delivered in five sessions by a team composed by an expert in digital storytelling, and an Afrikaans-speaking South African education researcher. Participants were assisted in creating individual digital stories focused on the theme 'The role of technology in education', in a sequence of steps blending narrative authoring exercises and engagement with ICTs. Training methods blended lectures, group discussions, and hands-on sessions. In-depth information was provided via an eLearning course used as repository for digital resources. The training was also a means to elicit participants' elaborate outlooks on technology and education by means of triggered reflections, group discussions and the story circle (focused discussions about each participant's story idea).

3.2 Data generation

This paper draws on qualitative data collected in the second part of the study, involving the 11 participants in the digital storytelling training. An ethnographic approach for data generation was designed, followed by inductive coding and analysis based on grounded theory principles. In line with the study objectives, focused on understanding changes in technology attitudes and associated constructs, data generation was designed to cover three moments: before, during, and

after the training. Data gathered covered the following areas of investigation:

1. motivations to participate in training
2. perceived meaning of educational technology
3. perceived impacts of technology on/in education
4. confidence in using technology in education
5. technological competences
6. intentions and scenarios for ICT integration
7. general satisfaction with the training.

Pre-training data collection included a short oral interview and an online questionnaire with mainly open questions, as well as participants' expression of interests, in the form of a letter submitted in order to be selected. During the training, the trainer kept detailed field notes on participants' behaviour, and documented their inputs. After the training, data was elicited from a focus group held at each university venue, the digital story scripts created by participants, and a post-training questionnaire eliciting participants' reflections prompted by open-ended questions.

3.3 Data analysis

Data coding and analysis were done in the vein of grounded theory analysis, based on the principle of the constant comparative method [20]. This method refers to the gradual conceptualisation of empirical data, by making constant comparisons between data, emerging codes, and concepts in waves of coding and analysis, until reaching theoretical saturation for emerging concepts. This iterative process of coding and analysis has three sequential yet partially overlapping phases: open, focused (or intermediate), and theoretical coding. During open coding, an initial data set was coded by one researcher not familiar with the data at a fine level of detail, assigning codes to thematic units, or the shortest meaning-making units in the textual data. Insofar as possible, in vivo codes (capturing the terminology of participants) were used, such as 'technology is (as) the future', 'passion(ate) for teaching', and '(fear of) being left behind'. During the coding process emerging concepts and relations were elicited, and resulting codes were stored and analysed. In a second wave, coding was resumed by a second researcher well familiar with the data, and the soundness of the codes and concepts was verified through constant comparative analysis, adding a new data set. In this process, codes were reduced to those that gave maximum substance to the concepts identified, and stored in a codebook.

During focused coding, the remainder of the data set was coded using the codes in the codebook. Emerging codes were fitted only if serving to shape the definition of conceptual categories, sub-categories and relations among these. During theoretical coding, the analysis was focused exclusively to the level of the categories and sub-categories, as well as relations among these. Each category was described and typified, relations between categories and sub-categories verified, and horizontal relations between categories marked.

The attitudes towards technology were conceptualised in terms of cognitive components (thoughts, beliefs, and perceptions about technology, e.g., 'technology is in constant evolution') and affective components (feelings about technology, e.g., 'I am excited by technological change'). The concept of 'aspiration' was construed by blending two complementary and at times overlapping constructs: professional goal and perception of one's role in the chosen profession (type of impact one expects to make as future teacher). Technological competences were conceptualised going from hands-on skills (e.g., ability to edit an audio file) to more complex technological-pedagogical uses (e.g., ability to use storytelling software for learners' engagement). Finally, grounded theory was also used to hypothesise four ideal types of pre-service teachers based on the comparison and corroboration of cognitive and affective attitudes toward technology in relation to the professional aspirations of participants.

4 RESULTS

This section provides a detailed account of pre-service teachers' professional aspirations and attitudes towards technology. Further, relations between aspirations and attitudes are analysed, and on this basis the profiles of four ideal types of pre-service teachers, derived from the grounded analysis, are introduced.

4.1 Attitudes toward technology

4.1.1 Cognitive attitudes

Cognitive attitudes encompassed participants' perceptions and beliefs about technology and its role in society and education, including perceived impacts and potential benefits, as well as negative effects. Three main perceptions were common to all participants:

- technological evolution. The rapid pace of technological evolution was punctuated repeatedly through key phrases (e.g., 'technology is changing so fast'), as well as through examples from education and social life.
- technological ubiquity. Participants indicated that 'technology is everywhere', it is permeating everyday life and activities. For instance:

  > Everything is digital, everything is becoming small and compact.
  >
  > (F, FET: story sharing circle)

- technology driving change. Participants thought that technology causes changes in society and education at an unprecedented level.

The impacts of technology on society and education were formulated in terms of benefits and negative effects. Two broad frames can be highlighted: firstly the development frame, by which technology is prone to mark, bridge or deepen divides between advantaged and disadvantaged groups and learners; secondly the innovation frame, by which technology is a mark of innovation in society and education.

With respect to the development frame, participants associated the impacts as well as potential benefits of technology with existing divides between advantaged/developed and disadvantaged/underdeveloped

contexts, groups, schools, and learners. Technology could, at the same time:

punctuate existing divides. In wealthy schools, students and teachers are provided with access to technology, so that learners develop digital literacy skills. This places them in an advantageous position with respect to under-resourced schools, where technology is lacking, poorly maintained, and where technical skills are low.

accentuate existing divides by defining new standards for social and educational opportunities. Having computer literacy is becoming increasingly important for job opportunities and professional development. For example:

> In our community you have to be a computer literate to do a certain job. We have tourists and stuff, and there's an information area for people to work in. So you have to use a computer for that.
>
> (M, ISP: focus group)

bridge these divides. Technology was perceived as well as a factor that could facilitate transfer of information, skills and expertise for the development of less advantaged groups, and create new jobs and social opportunities:

> While the technology is growing there's jobs, and many opportunities going with the change of technology.
>
> (F, FP: focus group)

With respect to the innovation frame, students thought that technology marks a rupture between the old and the new, the modern and the traditional. In education, technology marks the transition from a teacher-centred model with one-way information transfer, to student-centred learning in a fun, creative and engaging way. For example, the story idea shared by a participant in the story circle sets in opposition the classroom of the past ('having the teacher in the centre'), with the education of the future:

> where technology mediates all sorts of learning and teaching processes. The teacher is no longer in the centre, and he is not the only one to provide knowledge. The student has many sources of information. Learning is cooperation, everyone learns from the others, and everybody benefits.
>
> (UNI-1, trainer's notes: story circle)

4.1.2 Affective attitudes

Despite the fact that all participants were interested to improve their technological skills, their affective attitudes towards technology were not uniformly characterized by positive feelings or enthusiasm. Three patterns of affective attitudes relating to technology could be identified:

1. passion for technology
2. fear of being left behind
3. rationalised enthusiasm

Passion for technology. This position was embraced by very few of the participants, but when present it was characterized by an almost religious sense of relating to technology. Passion was driven by fascination for technical devices, and the potential to enable the human being to do things unimagined before. For instance, one of the most enthusiastic participants wrote:

> I am devoted towards the use of technology and get fascinated on a daily basis by what we as human kind can learn by only a click of a button.
>
> (M, ISP: expression of interest)

Fear of being left behind. This was, by contrast, a position marked by fear of failure, of being left behind by constant changes and advances in technology. Most participants expressed this attitude, punctuated through phrases like 'being left behind', 'falling behind', in relation to accounts on change and evolution of technology. These participants openly expressed their fear of being in the category of those falling or lagging behind.

> (Y)ou cannot be left behind. We need to stay on track. (...) I feel that I need to stay in the game and stay with the technology, cause I'm not there yet, and I'm staying behind, and that's why I need to get in there and be on top of technology.
>
> (F, ISP: focus group)

Rationalised enthusiasm. For some participants, affective attitudes were marked by rationalisation of technology impacts and benefits. They reflect growing importance in society and education, in particular for defining new standards for professional development. Participants with this attitude tended to associate their feelings for technology with accounts of benefits and impacts.

> Kids in the high school find technology and all the stuff that is changing so interesting, that I think they want to see the change in their education also. So that is why I think this is really important and I feel very excited for using this in my classroom.
>
> (F, FET: pre-training interview)

4.2 Aspirations and technology

The analysis revealed four aspirational drivers for the future profession:

1. Effective teaching
2. Helping the disadvantaged and the disabled
3. Achieving professional self-development
4. Innovating educational practice

Technology was seen as a means instrumental in fulfilling these aspirations. Participants thought that by increasing their capacity to use technology, they can make a difference as teachers, and get closer to the type of professional figure they wanted to embody. The perceived role of technology in helping them achieve

their aspirations was most evident in the scenarios that they pictured for technology integration, which reflected associated areas of interest.

Effective teaching. Participants characterised by this aspiration ($n = 4$) weighed success in terms of development of the learners' capacity. For example, a participant wrote in her expression of interest:

> I want to be a teacher who makes use of all possible resources so that teaching and learning take place as effectively as possible. By improving my skills I improve the standard of my teaching and the students get quality education.
>
> (F, ISP)

Technology was valued as a tool to achieve this by enabling more effective, novel forms of teaching and learning. For the learner, technology usage was thought to foster creativity development, engagement, and easier and faster comprehension. For the teacher, technology could save time, enable multiple ways of presenting the same information, help with lessons planning, and support engaging ways of delivering lectures.

Helping the disadvantaged and the disabled. Some participants ($n = 2$) wanted to help the disadvantaged, those from under-resourced communities and those with special needs. Technology was seen to open new possibilities to enhance their development. This aspiration was associated with inclusive education scenarios, in which disadvantaged children or children with disabilities are helped to learn faster and easier, and to integrate with their peers. For example, the digital story of one girl, written in first person, centres on the case of a child affected by dyslexia:

> I will remain here quiet classified as dumb or lazy.

With the aid of technology, the child is helped to read and write, and also feel integrated with peers:

> Today I stand in front of my class not worrying about the staring eyes while I read a vital piece of information that I have created and researched on my own to help my fellow classmates.
>
> (F, FP)

Achieving professional self-development. This aspiration was centred on the self, and moulded around the imagined figure of a successful educator, ahead of the times and in tune with the latest advancements. Participants with this aspiration ($n = 2$) perceived technological skills as essential assets for enabling the teacher to be successful in an environment marked by an increasing importance of technology. For instance, answering to a question about reasons for participating in training, a participant stated:

> As an educator we need to stay with the times. Technology is part of our daily lives and we need to be able to adjust and use technology effectively.
>
> (F, ISP)

Innovating educational practice. The focus in this aspiration is on bringing about change and novelty. Participants ($n = 3$) perceived technology as the key element that triggers change in educational practice. By being ahead of technological evolution, the teacher is also an implementer of change, a pioneer. For example:

> I am excited about the change that it (technology) would bring to the world of education and I want to be part of it.
>
> (F, FET: expression of interest)

4.3 Ideal types of pre-service teachers

The professional aspirations of pre-service teachers are found to relate to their attitudes towards technology, and can be structured around four idealised types of pre-service teachers: the model teacher, the humanitarian, the achiever, and the innovator (Table 1). This is based on the four predominant aspirational drives that are observed, but there are certain common characteristics: a high intention to integrate ICTs in teaching; high motivation to train and better their ICT skills; and a common outlook on the most significant impacts of technology on society and education: perceptions of technological evolution, technological pervasiveness, and technology driving change. They differ in the way their aspirations relate to their feelings for technology, and more subtle nuances of the perceived impacts and benefits of technology.

The model teacher aspires to become a professional figure who will make a difference in learners' growth and development. The model teacher is not preoccupied with the value of technology itself, but rather with the benefits it can bring if employed skilfully. The positive attitude towards technology is characterised by rationalised enthusiasm, triggered by an acknowledgement of its benefits. For instance, a participant stated:

> I expect to learn more about digital storytelling and how I can use digital (technology) to make my lessons better for the learners. (...) I will use it to make my lessons more creative. It is important to use technology, because you can develop the learners more visually.
>
> (F, ISP: pre-training interview)

The humanitarian wants to make a difference in the lives of the poor, excluded, and disadvantaged. S/he may be interested in assisting the needs of illiterate people in rural areas as well as of disabled learners. Technology can be seen in a dual light, as an indicator of socio-economic development, but also as a tool that can foster empowerment. This understanding can drive the humanitarian to explore its potential and use it to foster equal access and inclusion for disadvantaged groups and learners. Affective attitudes can be described as rationalised enthusiasm: the humanitarian relates positively to technology due to acknowledgment of its potential benefits. For example, a participant's motivation to partake in training included:

> ... (I)n our community there are not many opportunities for learners and to be involved with technology. I think this can help me gain knowledge, and to go back there. (...) And being able to work with technology I can help them learn more.
>
> (F, ISP: pre-training interview)

The achiever aspires to excellence in her/his profession. S/he acknowledges the growing importance of technology in society and education and tends to associate it with innovation and change. S/he reckons the importance of ICT knowledge and skills for keeping up with change and gaining access to social opportunities where these are required. At the affective level, S/he fears that S/he may be left behind, which motivates her/him to constantly upgrade knowledge of ICTs. A typical phrase of the achiever reads:

> (...) Everything is just developing and changing so fast, and (...) we need to keep up with the change and we can't stay where we are, (...) that's why we always need to innovate, change in the way we teach.
>
> (F, FET: pre-training interview)

The innovator stands out among the other profiles for the central place s/he assigns to technology. Her/his dream is to foster innovation in education, and for this technology is a major asset. The innovator is driven by passion for technology and faith in what it can do for the human being, and in particular for the teacher. S/he aspires to spread and pioneer innovative practices through ICT, so that everyone can benefit from the promises of technology. For the innovator, simply,

> Technology is the future.
>
> (M, ISP: repetitive phrase)

Each profile was found to illustrate in a comprehensive manner the most significant drives for participants' high intention to integrate ICT, as well as their motivation to engage in ICT training. Yet it is to be noted that the profiles were constructed drawing on a selection of the most significant and strong elements, without denying the influence of others, such as for instance attitudes towards the teaching profession, confidence in using ICT, or levels of ICT skills.

5 DISCUSSION

This section discusses the findings of the study along two arguments pinpointing the relations between aspirations and attitudes towards technology.

Technology is perceived as a tool instrumental in the fulfilment of professional aspirations. The analysis identifies the role of technology as a core enabling factor for realizing pre-service teachers' professional aspirations: technology is seen to make the difference between dreaming and becoming the figures they aspire to. Yet, as different from the mystified views of technology reported in the literature (e.g., [2] [3]), pre-service teachers demonstrate a clear vision of the capacities required to reach out to these aspirations, which include, but are not limited to technological competence. Most pre-service teachers remarked that technological competence was an essential asset, yet by no means the only one, making a teacher 'not better', but rather 'more equipped' (UNI-1, focus group). Their aspirations can be described as 'navigational capacities' [5], demonstrating clear relations between means and goals.

Cognitive and affective attitudes towards technology reveal further differences. At the cognitive level, pre-service teachers share the unquestioned belief that society and education are moving towards increasing technologisation. Technology skills and access to technology are therefore accepted as necessary conditions to become worthy professional figures in a landscape marked by the ubiquity of technology. The perceived role of technology as an enabling tool does not depend on whether the participant likes technology or not. It is, rather, the conviction that technology is important, pervasive and changing, that drives pre-service teachers to see it as essential. At the affective level, one could be passionate about technology, but also fearful of being left behind by technological advancements. Some pre-service teachers even rationalise their feelings for technology, and bring powerful arguments about its benefits to counter-act what would have been otherwise negative, neutral or low feelings towards technology.

A strong aspiration appears, therefore, to function as a driver for the rationalisation of anti-technology stances, to the extent that technology is perceived rationally to help fulfil the aspiration. For example, Anne (fictitious name) was the most anti-technology figure in the group, and spoke openly about the dangers, lures, and pitfalls of technology. Yet, like the others, she believed technology to be pervasive, evolving and driving change. At the same time, she was a perfect embodiment of the humanitarian ideal type. She wanted to help members of her community and other impoverished groups to rise above their condition and live a better life. This was her uttermost driving force. Two observations can be made for her case. First, her aspiration was stronger than her anti-technology stance, so that even if she saw negative sides of technology, she was eager to train and use technology, to the extent that she was convinced that technology was important for reaching her goals. Second, the contradictions at cognitive and affective level were solved by a tendency to align, for instance by rationalising her negative feelings for technology. Accounts of negative uses were compensated by accounts in which marginalised people were integrated and changed through training programs.

Aspirations are powerful drivers. Aspirations influence (i) technology adoption, (ii) the motivation to enhance technological competence, and (iii) projected usage patterns.

Professional aspirations appear to determine significantly the motivation to integrate technology in education and to take ICT training, to keep ahead of technological evolution. They also appear to act as a colouring lens in picturing technology integration

scenarios. For instance, pre-service teachers with a strong humanitarian drive tend to picture scenarios of helping the poor and the disabled. The model teacher envisages ways in which novel and effective forms of teaching and learning could be enabled by technology.

The analysis looked as well at the role of the training imparted as a factor of change in either attitudes or aspirations. Training does not appear to change aspirations, and has only a minimal effect on changing attitudes towards technology. Participants who were against heavy technologisation, such as Anne, maintained this attitude until the very end. What the training did was to expand the window of perception for technology potentials, increase confidence, and make participants feel more able to work towards the achievements of their professional aspirations. In the post-training focus group, most participants indicated that the interactive whiteboard and the digital storytelling trainings unveiled possibilities of using technology not imagined before, and also made them feel more self-confident, sometimes unearthing abilities they did not know they possessed. For instance:

> I usually don't think I'm very creative. But it helped me to realize that I can be creative, I have to try!
>
> (F, FP)

This triggered enthusiasm, but also creativity in picturing technology uses. When prompted, participants came with ideas for employing digital storytelling that had not been introduced to them before, ranging from teaching blind people through sounds, counting in foundational mathematics classes, and more complex story authoring scenarios for further education classes.

These observations point to the importance of conceiving ICT training approaches not only as means for skills transfer, but also exposure to novel educational technology uses, which leave space for participants' own interpretation and adaptation to fit a teaching approach still in the making. The role of trainers as role models, confident and knowledgeable users of technology in education should also be taken into account as a means for expanding and enriching participants' aspirations and encouraging them to act in confidence for reaching their goals.

6 CONCLUSION

This article discussed relations between professional aspirations and attitudes towards technology in the South African teacher education context. Two main arguments have been put forward.

First, pre-service teachers see technology as an enabler for achieving their aspirations to become worthy professional figures. Technology is one of the ladders that connect dreams to reachable outcomes. Mastery of technology, supported by continuous training, is perceived as a must for becoming a successful professional in an educational landscape increasingly marked by the penetration of technology.

Second, findings show that the aspirations of pre-service teachers are powerful drivers for technology integration and motivation to train. They also influence the formulation of distinct scenarios of technology integration in education. 'Becoming a (certain kind of) teacher', rather than 'what technology can do', is the central driver when picturing the role of technology in education.

The article contributes to understanding the complex relations between aspirations, technology, and enhanced capabilities in reaching developmental outcomes. It has been argued in the literature that enhanced capabilities may be the most important missing link between strengthening aspirations and development (e.g., [8] [10]). In the present study, we dealt with students who had not only strong aspirations, but also strong views on what is needed to reach them: aspirations were not formulated as vague and distant dreams, but as 'navigational capacities' [5], with clear associations between means and ends.

The importance of developing technological competence for fulfilling aspirations indicates to what extent technological proficiency is considered a must by pre-service teachers who want to succeed. Yet, reading through the study findings we suggest as well that aspirations for professional development are important factors that shape in turn visions and meanings of technology integration. The pre-service teachers involved did not appear to be hasty adopters and blind believers in the potential of technology. Rather, they modelled goals and aspirations they already held around what was perceived, like a major factor of change, innovation and development in society.

These findings are the result of a study which opted for depth over breadth and took an inductive approach to examine the place of aspirations in relation to technology and development, an interplay which has been insufficiently explored in ICT4D research in Africa. To this purpose, the study involved a small number of participants, and employed a multi-method approach to capture their understandings, perceptions and attitudes. Given the limited sample, the results of the study are proposed as leads and openings for further research that may probe these propositions with larger samples or in different socio-cultural contexts. Building on these leads, future research could examine relations between aspirations and technology attitudes either taking a comparative perspective (between different socio-cultural contexts) or an evolutionary one (through longitudinal studies involving the same group of participants). The study of transitions from pre-service to in-service teaching, as well as the influence that teachers are likely to exert on their students' attitudes and aspirations are also aspects worthy of further investigation.

At methodological level, we propose that inductive methodological approaches such as grounded theory methodology can benefit future ICT4D research, in particular when there is a need to unearth relations between factors affecting development that have not been tackled by prior studies, or for examining phenomena from a perspective that has not been considered before.

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