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# Dimensions of Professionalism

## *A Study of Computer Science Teaching in Saudi Arabia*

FAYIQ ALGHAMDI

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**Abstract**
Alghamdi, F. 2020. Dimensions of Professionalism. A Study of Computer Science Teaching in Saudi Arabia. *Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology* 1965. 62 pp. Uppsala: Acta Universitatis Upsaliensis. ISBN 978-91-513-1004-6.

In Saudi Arabia, new computing education programs have been introduced in alignment with the Saudi Vision 2030, which is a plan launched in 2017 to reduce Saudi Arabia's reliance on oil, diversify its economy, and develop its health, education, recreation, infrastructure and tourism. Computer science is a rapidly changing area, which places high demands on teachers in the subject to develop both their subject and pedagogical competence. This thesis explores computer science teachers' perspectives on professional development from three viewpoints—the Saudi Teaching Competencies Standard, engagement in teachers' awards and self-directed learning. The thesis examines the efforts of computer science teachers as they develop new pedagogies during their teaching careers as a result of the new regulations. The main question is 'How do Saudi Arabian computer science teachers develop their teaching professionalism?' Conclusions draw on the outcomes of four sub-studies. A mixed-methods approach consisting of interviews and questionnaires was used to collect data. The participants comprised 389 computer science teachers from different Saudi Arabian cities with different demographics and different teaching experience. The analysis drew on a theoretical framework that integrates elements of the Theory of Reasoned Action, the Theory of Planned Behaviour and the Adult Learning Theory. A model for pedagogical change was developed and used to understand how and why computer science teachers change their educational pedagogy. The model explains the teachers' shift in pedagogy and answers the question of how and why computer science teachers adopt a new pedagogical strategy. The studies show that both internal and external factors motivate the study participants to engage in competency development. In the Saudi model, the Saudi Teaching Competencies Standard and awards are external factors as they include a preparatory period of intensive skills development. Teachers' experience from this informs the picture of Saudi teachers' training that is presented in the dissertation. Indeed, the trial participants stated that they mainly used self-directed learning for their competence development, drawing on internal motivation. One reason for this was that they felt that many of the skills development programs offered lacked timeliness and relevance. The studies on which the dissertation is based have been conducted in Saudi Arabia, but the results also provide insights into general challenges associated with regulating teachers' competence and the design of in-service training for teachers. The results clearly point out the importance of teachers' participation in the development of the profession in order for changes to be accepted and incorporated into their profession. Behavior change theories can be used to understand and predict how new regulations and pedagogical strategies will be received, and if they are likely to be accepted or rejected by teachers. These theories, therefore, constitute a useful tool in regulating teaching and the teaching profession.

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# List of Papers

This thesis is based on the following papers, which are referred to in the text using Roman numerals.

I Alghamdi, F., Pears, A., & Nylén, A. "Computer science teachers' perspectives on competencies: A case study in the Kingdom of Saudi Arabia", *Fundamentals of Computer Science and Software Engineering,* ISSEP 2018, *Springer*, pp. 129-140., October 10–12, Saint Petersburg, Russia.

II Alghamdi, F., Nylén, A., & Pears, A. "Changing the Educational Epistemologies of Computer Science Teachers - A Case Study of the Kingdom of Saudi Arabia", *IEEE Frontiers in Education Conference (FIE)*, 2018, pp. 1-9, October 03-06, San Jose, CA, USA.

III Alghamdi, F., Nylén, A., & Pears, A. "Teachers' Awards - an Incentive for Pedagogical Development in Saudi Arabia", *IEEE Frontiers in Education Conference (FIE)*, 2019, pp. 1-6, October 16-19, Cincinnati, OH, USA.

IV Alghamdi, F., & Nylén, A. "Why Computer Science teachers in Saudi Arabia Learn on Their Own: Impulse for Self-Directed Professional Development in CS teaching", submitted to Scientific Research Journal. 2020.

*To my inspiring parents (Saeed and Monerh), my sweet wife (Ebtehal) and my lovely children (Sadeem, Raneem, Allulu and Abdulaziz)*

# Comments on my Contribution and Publication Status

As the main author in all papers, I take responsibility for the work. Ideas and results were discussed regularly with my supervisors.

I I collected and analysed the data. I wrote the paper, with feedback from all supervisors.

II As in paper I.

III I developed the idea in Paper III, discussed the results with all supervisors and wrote the paper.

IV I designed the survey in Paper IV, and I collected and analysed the data. I wrote the paper, with feedback from the main supervisor.

Publication status: Papers I–III are published. Paper IV was submitted to the *Scientific Research Journal* in 2020.

# Other work:

1. Alghamdi, Fayiq. “Women in Computing in Saudi Arabia”, 3rd ACM-W Europe Celebration of Women in Computing, 1-3. *WomENcourage* 2016, September 12–13, Linz, Austria.
2. Alghamdi, Fayiq. “Why do female students choose to study CS in the Kingdom of Saudi Arabia?”, In: Proc. 5th International Conference on Learning and Teaching in Computing and Engineering, *IEEE Computer Society*, 2017, p. 49-53. *5th International Conference on Learning and Teaching in Computing and Engineering (LaTiCE 2017)*, April 20–23 2017, Hong Kong.
3. Alghamdi, Fayiq. “Impact of the teacher’s award on Changing Educational Epistemology in teaching CS in the KSA”. *IEEE Frontiers in Education Conference (FIE)* 2018, San Jose, CA, USA.

# Contents

# Abbreviations

| | |
|---|---|
| STCS | The Saudi Teaching Competencies Standard |
| SDL | Self-Directed Learning |
| SA | Saudi Arabia |
| NECPD | National Educational Centre for Professional Development |
| CS | Computer Science |
| PD | Professional Development |
| CER | Computing Education Research |
| NTP | The National Transformation Program |
| TRA | Theory of Reasoned Action |
| TPB | Theory of Planned Behaviour |
| TAL | Theory of Adult Learning |
| RAA | Reasoned Action Approach |

# 1 Introduction

In mid-2015, I presented a PhD proposal on mobile learning at the first Al-Baha University and Uppsala University collaborative educational Symposium on Quality in Computing Education (1st ABU3QCE). This was a local symposium focused on how to improve the quality of computing education in Saudi Arabia (SA). This topic was strongly related to my interest in computing education, as my plan was to advance my career.

I began my PhD studies in 2016. I undertook coursework with international students and became interested in having an overarching gender focus for my work due to the low number of women in computing education in Sweden compared to SA. This presented an opportunity to conduct a comparative study. In Sweden, 22% of students studying computer science (CS) are women ( Swedish Higher Education Authority, 2020) compared to 45.8% in SA (The General Authority for Statistics, 2019). Discovering why there are more female CS students in SA than in Sweden became my new research objective; therefore, I began to observe women in computing education in SA to understand the phenomena. The results are impressive and overwhelming; they show that CS teachers are the main reason many female students choose to study CS.

With my background and experience as a CS teacher in SA, studying the pedagogical perspectives and professionalism of CS teachers in SA and how and why they inspire students to enter this field became my main research interests. As a student at Raghdan school, I became interested in being a teacher, inspired by the communication skills, teaching practices and character of several of the teachers. Even today, I benefit from those teachers' practices and see some teachers as my role models.

Professional development (PD) is a practice teacher engage in to improve their teaching skills and acquire more expertise, as their role is to transfer knowledge, skills and competencies to their students. The primary goals of PD programs are changing teachers' practices, attitudes and beliefs and students' learning outcomes (Williams & Hayler, 2015). PD programs are typically designed to stimulate acceptance, engagement and excitement among teachers and school leaders before being implemented. Sometimes, these programs appear in the form of new policies or approaches based on the assumption they will improve or change teachers' attitudes and beliefs. However, as critical as this is, they rarely change the positions of teachers and do not require a strong commitment from teachers (Fullan, 2001).

In the Saudi Arabian education sector, PD is viewed by the Ministry of Education as part of a systematic plan to change teachers' attitudes and classroom practices and students' learning outcomes. PD programs for teachers have been evolving for a long time. In 1975, PD was under the General Administration of Teacher Preparation Programs. In 1981, the General Administration of Educational Guidance and Training took over the responsibility. In 1998, the name of the PD program was changed to the General Administration for Educational Training and Scholarships, and there were two types of PD programs, Teacher Coaching and Teacher Scholarships. In 2003, a division for training and scholarship was created in each of the 49 educational offices throughout SA (Albahiri, 2010). In the last two years, the National Educational Centre for Professional Development (NECPD) became responsible for teachers' PD programs.

The literature states that teachers resist engaging in PD because they want to maintain their old approaches (Richardson, 1998). The literature has also revealed a pressing need to better train CS teachers in both pedagogy and computing. Several studies have identified a lack of PD among CS teachers (Mansour, Alshamrani, Aldahmash, & Alqudah, 2013) and (Menekse, 2015). There is a plethora of educational technology resources available to teachers who lack pedagogical instruction (Waite, 2017).

This research on professionalism in CS teaching was carried out with the goal of understanding how lifelong learning should be supported by government or stakeholders to increase motivation for self-directed learning (SDL).

The Ministry of Education in SA has recently instituted the Saudi Teachers Competencies Standard (STCS). The STCS requires all teachers to undertake PD. The Saudi Arabian educational transformation program has one fundamental focus, which is the training and development of teachers and improving recruitment. The Ministry aims to improve the quality of education and ensure the teaching of 21$^{st}$ century skills. Teachers' awards and SDL are other way teachers can meet the requirements of teacher education.

Various aspects of CS are increasingly being taught in primary and secondary schools worldwide (Yadav, Gretter, Hambrusch, & Sands, 2016). The Saudi Ministry of Education has proposed a plan to include computing in primary schools. This was implemented in 100 primary schools in 2019 and will be expanding year by year. As a researcher, it is my ambition to provide another perspective of the CS teacher training system and introduce the latest research outcomes in computing education in Western countries to the Middle East.

The point of departure for this thesis is CS teachers' understanding of changing prosses of pedagogical development and the challenges they face in teaching. The thesis discusses the perspectives of teachers as they study to develop their pedagogy in the context of the rules set by the Ministry of Education. CS teachers need to know how to successfully implement the Behavioural Change Theories to be recognized when the educational provider plans

the teachers' PD program. Furthermore, the perspectives of current CS teachers should be reflected in the training program plans.

PD programs are mechanisms for change. There are many national and international programs for in-service training targeting CS teachers. These programs are expected to improve CS teachers' knowledge and increase their competency to apply current CS teaching practices.

In this thesis, the question is **How do Saudi Arabian CS teachers develop their professionalism?** This question is divided into four sub-questions:

1. How are teaching competencies achieved and controlled, and what help is available to support teaching CS competently in the SA?
2. How and why do CS teachers adopt new educational beliefs in their pedagogy?
3. How have K–12 CS teachers in SA changed their pedagogy as a result of one year of PD leading up to winning a teacher's award?
4. Why CS teachers were influenced by self-directed professional development in CS teaching?

# 2 Research Context

## 2.1 Education in Saudi Arabia

Education in SA has five educational levels—kindergarten, elementary, intermediate, secondary and tertiary education. Elementary, intermediate and secondary education are compulsory, while kindergarten and tertiary education (i.e. university education) are optional. In secondary school, students can choose one of two specialized tracks (sciences or humanities). Currently, the Ministry of Education controls all categories of education.

The total number of schools in SA is 35,500, and 18,710 of these are female-only schools. SA also has 42 universities and 112 colleges. Universities typically have two gender-separated campuses. Gender separation in education is defined in the Education Policy Document of 1969 (Shahwan, 2012). It is a fundamental issue that affects not only women's education but also Saudi society (Hamdan, 2005). The population of SA is 32.6 million, with 7.3 million students and 504,738 teachers (The General Authority for Statistics, 2019). In 2016, the student-to-teacher ratio was 20:3 in tertiary education, 11:7 in secondary education and 10:3 in pre-secondary education (Puri-Mirza, 2018).

## 2.2 Education in Sweden

Education in Sweden has three levels. Primary education is compulsory for those aged 6–15, and upper secondary education for those aged 16–19 is not compulsory but necessary to continue to the optional tertiary level. Basic education in Sweden focuses on the importance of play in a student's development, with a curriculum intended to meet students' individual needs.

Gender-aware education is more common, aiming to provide students with the same opportunities in life (Taguma, Litjens, & Makowiecki, 2013). Sweden has a population of 10.2 million, of which students' number 1,397,390 and teachers' number 117,812 (Skolverket, 2018). In 2016, the student-to-teacher ratio was 12:3 in tertiary education, 11:7 in upper secondary education and 12:3 in primary education (Jürgensen, 2019). Sweden has 14 universities and 17 colleges. The Swedish system involves not only traditional university but also teacher training, health care training, technical training, etc. Regional authorities, private interests and the central government are responsible for

managing tertiary education in Sweden. All higher educational institutions in Sweden are managed by the Swedish Ministry of Education (Skolverket, 2018).

## 2.3 Saudi Arabian Culture and Swedish Culture

To understand and help readers identify similarities and differences between cultures (Saudi Arabian and Swedish), we used Hofstede's theory of cultural dimensions. Hofstede defines culture as 'the collective programming of the human mind that distinguishes the members of one human group from those of another. Culture, in this sense, is a system of collectively held values' (Hofstede, Hofstede, & Minkov., 2005).

Hofstede's definition encompasses six cultural dimensions—power distance, individualism vs. collectivism, masculinity vs. femininity, uncertainty avoidance, long- vs. short-term orientation and indulgence vs restraint. Hofstede's theory has been used in studies on health care and education with a similar focus to the present study (Mayan, 2019), (Dennehy, 2015), (Cronjé, 2011). It is essential to note that the point of departure for the present study is the cultural similarities and differences between SA and Sweden. Importantly, the study considers the limitations and nature of Saudi Arabian and Swedish culture (see Figure 1). Hofstede applied his model to 100,000 people in 93 different countries, including SA and Sweden, to analyse the differences in culture among nations (Hofstede, 2019).

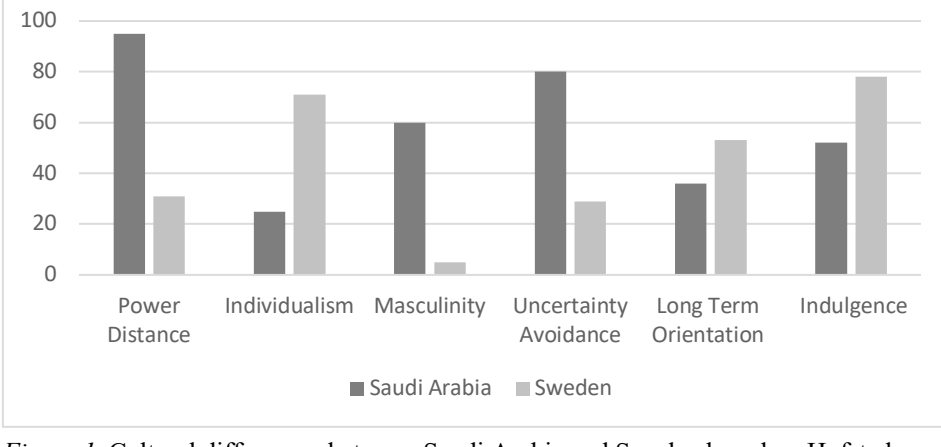


*Figure 1.* Cultural differences between Saudi Arabia and Sweden based on Hofstede (2017)

Power distance is defined as to what degree the less powerful members of a country's institutions and organizations assume and accept that power is unequally distributed. This factor addresses the point that all people are not equal

and reveals cultural attitudes. SA scores high on this dimension with 95 points, while Sweden scores lower with 31 points. This means that people in SA accept that the Council of Ministers produce policies and that people should follow these policies even when they are negatively affected by them. People in Sweden, however, expect a higher level of self-determination with more equality between leaders and citizens.

Individualism is the level of interdependence between the members of society. We could use the terms 'I' or 'we' to exemplify this. In individualist societies, people are assumed to look after their immediate family only. In collectivist societies, people take responsibility for their extended families. In this regard, SA scores low with 25 points, indicating a collectivistic society, while Sweden scores high with 71 points, indicating an individualist society.

Masculinity vs. femininity relates to gender roles. Being competitive, ambitious, materialistic and assertive is masculine, and being caring, nurturing, modest and compassionate is feminine. Regarding this dimension, SA scores 60 points and is thus considered a masculine society. In contrast, Sweden scores 5 points and is considered a feminine society. Regulations and policies on gender equity in Sweden, for instance, are affected by women's voice. However, SA is changing rapidly and is starting to give women more power. In terms of empowering women, SA ranks first among the Gulf countries and second among Arab countries (World Bank Group, 2020 ).

Uncertainty avoidance refers to people's tolerance in relation to accepting change. SA scores 80 points on this dimension, meaning that Saudi Arabians are cautious when it comes to change. Sweden scores 29 points, which means Swedes tend to embrace change as it occurs. In SA, people need more time to adopt new systems. There is a connection to this thesis with respect to this dimension and the speed of change. CS teachers in SA adapt more slowly to change than CS teachers in Sweden.

Long- vs. short-term orientation refers to the line each society maintains when addressing the difficulties of the present and the future. The normative nature of Saudi Arabian society is reflected by SA's low score of 36 points on this dimension. People have great respect for traditions and a focus on achieving quick results. In Sweden, however, there seems not to be clear expression regarding this dimension, as the country scores 53 points.

Indulgence vs. restraint refers to what degree people try to control their urges and impulses based on how they were brought up. SA's score on this dimension is 52 points, which is average. Sweden's score is 78 points, meaning it is a fairly indulgent culture.

# 3 Computing Education in Saudi Arabia

## 3.1 Saudi Arabian Educational System

Decision making in the SA educational system is subject to a pattern of regulation; this regulation is enforced by the 49 educational departments located in Saudi educational institutions. In these institutions, the structure of leadership is very hierarchical; decision-making processes are initiated by the Ministry of Education and then distributed to the school level. Two educational reforms have been implemented in recent years, the King Abdullah bin Abdul-Aziz Project for Public Education Development (called Tatweer) and Saudi Vision 2030.

Tatweer is an Arabic word meaning development. The main goal of the Tatweer reform is to improve the educational system and resolve challenges in the school curriculum. Tatweer was established to strengthen the Saudi educational system in 2007, when 50 schools were chosen to participate in a pilot scheme. Tatweer changes the philosophical focus of schools from being traditional learning environments to being smart learning arenas. The modern intelligent learning environment revolves around a facilitative leader and qualified teachers (Alyami, 2014). Tatweer serves as a liaison between the Ministry of Education and the private sector to support the private sector in educational investment (Tatweer Co., 2019). Currently, more than 1020 schools are engaged in the program.

Saudi Vision 2030 is based on three pillars—a thriving economy, a vibrant society and an ambitious homeland. Students are the main focus of the education sector, which takes responsibility for developing teachers' skills and enhancing their sense of creativity. In this perspective, Saudi teachers are recognized as one of the essential elements of the educational system (Saudi Vision 2030, 2017). In 2016, several challenges facing Saudi education were identified; therefore, the general aims of education were changed and achievement measurement indicators developed. The Saudi educational transformation plan has the following objectives:

1. Improving the recruitment, training and development of teachers.
2. Improving the learning atmosphere to stimulate creativity and innovation.
3. Improving curricula and teaching methods.
4. Improving students' values and core skills.
5. Developing financing methods and improving financial efficiency.

6. Educating students to address national development requirements and labour market demands.
7. Increasing private sector participation in the education sector (Saudi Vision 2030, 2017).

## 3.2 The History of Computing Education in Saudi Arabia

Computing is changing quickly and requires infrastructure and curriculum renewal through government strategies and regulations (Lagesen, 2008). The development of CS in Saudi schools can be traced to changes in the general education policy that includes technology to enhance educational efficiency. In 1982, the Saudi Ministry of Education introduced CS as a subject into the K9 to K12 curriculum. During this period, students studied CS one hour per week. In 1993, the national CS committee recommended updating the CS curriculum, thereby increasing CS content to two hours of instruction per week. Five years later, the Ministry of Education merged the research and library courses into the CS curriculum and introduced a new version of CS as a subject in grades 6–8. In 1997, CS as a subject was introduced into all-female schools. Subsequently, the CS curriculum has been the same for boys and girls (Al-Wakeel, 2001). Currently, CS is taught in grades 6–12 in Saudi schools. The CS curriculum is based on the Computer Science Teachers Association standard (CSTA K–12). The objective of CS education for students in grades 6–9 is to understand general CS. The CS curriculum for grades 10–12 emphasizes three learning objectives—programming, digital citizenship and contemporary applications (Education Development Department, 2013). At the university level, the first CS college was established in 1980 at King Saudi bin Abdelaziz University. Currently, there are 42 college-level CS programs at Saudi universities.

In 2015, Al Baha University accepted 62% of female applicants into the CS Bachelor's Program (Alghamdi F. , 2017). The Ministry of Education established the Saudi Computing Colleges Committee (SCCC) in 2012, which has 42 members and comprises the administrators of all the CS colleges in SA. The committee's main aim is to develop CS in SA. The SCCC runs bi-yearly conferences with a focus on improving the quality of CS education and building a network among the colleges.

## 3.3 CS Teachers in SA

CS teachers graduate from a CS college and then have to pass the national 'Teaching Competency' exam and the 'CS Teacher's Test' before they can

start their teaching career. These two tests are designed to ascertain candidates' understanding of CS and their teaching abilities before they are declared eligible to be appointed as CS teachers.

When CS teachers are appointed, there is an in-service program to strengthen their Professional Development. The program for novice teachers is guided by 'the Teachers' License' exam. All teachers have to take this exam every five years. It includes aspects of both CS and teaching skills. It is the teachers' responsibility to keep developing him/herself in their field under the supervision of the National Institute for Educational Professional Development (NIEPD) in order to continue to meet the requirements for professional practice. There are many programs available to teachers as PD in SA. This study has chosen three ways that affect teachers in their PD; the STCS, teachers' awards and Self-Directed Learning (SDL).

### 3.3.1 The Saudi Teachers Competencies Standard (STCS)

One of the programs designed to achieve Saudi Vision 2030 is the Saudi Teachers Competencies Standard (STCS). The standard states that 'We will prepare a modern curriculum focused on rigorous standards in literacy, numeracy, skills and character development. We will track progress and publish a sophisticated range of education outcomes, showing year-on-year improvements' (Saudi Vision 2030, 2017).

The effect of adopting the STCS is that teachers in SA must pay more attention to skill development. The STCS requires all teachers to develop teaching skills, knowledge and practice (Education Evaluation Commission, 2017). The STCS policy document consists of three parts. The first part concerns teachers' responsibilities and how teachers achieve the objectives. The second part elaborates the theoretical background of the standard. The third part describes how the STCS is to be applied and assessed (see Figure 2).

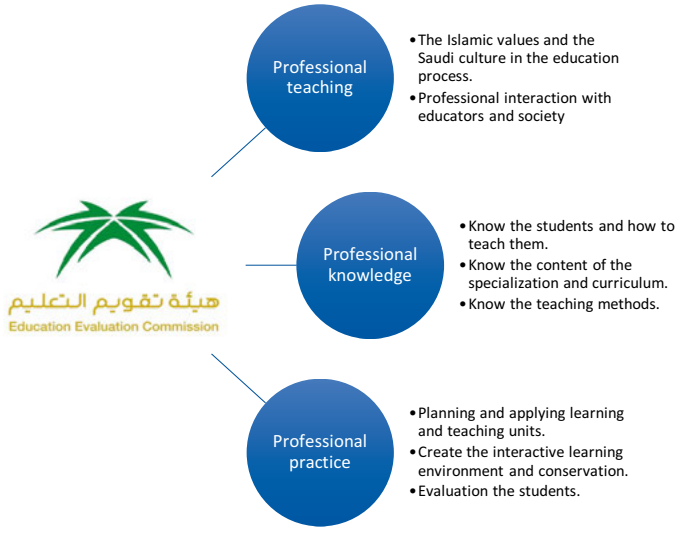


*Figure 2.* The Saudi Teachers Competencies Standard (STCS)

The STCS model is the product of recent research that focuses on teachers as learners. The Ministry of Education takes the responsibility of inspiring teachers in classroom practices. The STCS is based on the evidence that the quality of teaching depends on teachers' ability to take advantage of specific knowledge and skills in teaching. The STCS encompasses all plans that are related to the teaching profession, including pre-service teacher qualification such as issuing professional licenses and associated incentives, rewards for teachers, assessing the professional performance of teachers and teachers' growth, development and professional learning.

The STCS includes three interrelated and eight overlapping areas:

1. Professional teaching:
    a. Islamic values and Saudi culture
    b. Professional communication with society and educators
2. Professional knowledge
    a. Knowledge of students and how to teach them
    b. Content of the specialization and curriculum
    c. Teaching methods
3. Professional practice
    a. Planning the teaching
    b. Designing an interactive learning environment
    c. Evaluating students

The STCS is an approach to shaping the national education identity about the Saudi Arabian culture (Education Evaluation Commission, 2017).

Teachers' License is connected to the STCS. In the licensing procedure, teachers are divided into four categories or classes—graduated, practicing, advanced and expert. The classification is based on the duration of one's teaching career and on passing the exam. It is mandated that teachers be evaluated every five years. The Teachers' License is based on responsibility, knowledge and teaching practice. The requirements are intended to ensure that teachers have met the PD requirements developed by the Saudi Ministry of Education. However, the research presented here explores CS teachers' views on STCS and proposes modifications to the standard. Note that teachers need to attend workshops to understand the requirements (Alghamdi, F; Nylén, A; Pears, A, 2018).

### 3.3.2 Teachers' Awards

Teachers' awards are a second aspect in this thesis that explain how CS teachers develop their pedagogy. Educational awards have been implemented in SA since 2009. The two big awards in SA are the Education Excellence Award (EEA) and the Microsoft Expert in Education (MEE) Award. Usually, awards are connected to a ceremony or the last stage of a competition, but in this case each of these awards requires one year of preparation. The process starts with the application and ends with the completion of the requirements (typically associated with PD) and an evaluation. The EEA relates to teachers' development at the national level and is the embodiment of the culture of quality in teaching and of distinction in educational performance. The Ministry of Education encourages teachers' awards as one way to improve teaching performance.

Since the inception of the MEE award in 2009, more than 160,000 teachers have been shortlisted to receive it. Of these, only 730 have won the award, around 15% of which were CS teachers (The Education Excellence Award, 2018). In the field of education studies (Keeley, Ismail, & Buskist, 2016) and (Balfgeh, 2007) underline the importance of teaching awards to inspire teachers to engage in PD. Numerous countries worldwide have established their own system of teachers' awards, such as Taiwan, Canada, Australia, the US and the UK (Alghamdi, F; Nylén, A; & Pears, A, 2019). Employee awards are fairly common across the world and are used to encourage excellent performance in the course of discharging duties and responsibilities at work. Teachers' awards are a way to keep teachers motivated to pursue outstanding teaching and teaching practices.

The EEA has become an annual cultural event promoting outstanding educational practices in schools through the achievement of the following subgoals:

1. To promote excellence in public education and to value distinguished teachers, principals, students and schools

2. To disseminate a culture of excellence, quality, creativity, professionalism and commitment
3. To give the role of teacher value in society
4. To support the spirit of fair engagement among teachers to give their best
5. To develop the level of performance

The guidelines to select distinguished teachers are based on; Professional and scientific knowledge, Professional Development, Planning, Execution, Evaluation, Community activities and Professional initiatives.

The process of selection is as follows:

1. Announcement of the start of the award course and identification of the target groups at that session.
2. Starting the work from the centres of excellence and develop plans for dissemination, education, support and publishing dates for arbitration at the centre level.
3. Participants upload their files to the Centre of Excellence.
4. Arbitration committees are formed and evaluation of the candidates' files is performed to determine who has achieved the required percentage of excellence according to the criteria for each category.

The prize is only given to 24 teachers yearly; the award comprises money in the range of $3000 to $10000 and a certificate (The Education Excellence Award, 2018).

The MEE is publicly announced in August every year. SA takes first place in its area with 622 winners in 2019 (Microsoft Education Expert, 2018). Recognizing innovation depends on the capability of teachers, and the impact of teachers and technology is tremendous when combined. Technology requires teachers to achieve excellent outcomes in the classroom. Teachers who have won the award previously provide comprehensive explanations of Microsoft's new tools for education. Microsoft facilitates the exchange of best practices, as teachers use the products to promote innovation in teaching.

There are three stages in applying for the MEE award.

1. A teacher has to sign in the Microsoft Educator Community with a complete profile.
2. A teacher must ensure that he/she earn 1,000 points in online workshop; he/she must attend and participate online on the Education Microsoft platform and be certified as a Microsoft Innovative Educator (MIE).
3. A teacher is expected to create a 2-minute video presentation to answer questions on the use of technology in their class, how they

have influenced their peers and how they will support others in the coming year.

The prize consists of a certificate, free software and an invitation to attend the Microsoft international education conference (Microsoft Education Expert, 2018).

### 3.3.3 Self-Directed Learning (SDL)

The STSC and teachers' awards are clearly external motivation to change teaching practices. Self-Directed Learning (SDL) is internal motivation for teachers to acquire more knowledge and skills.

The idea for teachers to use SDL comes from Adult Learning Theory (ALT), which describes how adults learn. Adults have their own way of learning and promote the concept that adults declare their needs and then manage their learning (Knowles, 1978). When SDL is being arranged, adults will adapt their teaching strategies. Then, in the learning places, where SDL often occurs, adjust on the areas where learners determine based on shared interests and generally is acquired.

Training courses are the main sources of teachers' PD in SA, but these programs on the ground do not align with teachers interest until they need it directly (Mansour, Alshamrani, Aldahmash, & Alqudah, 2013). The Tatweer Company has produced six things to help teachers with their SDL; these are a guide book in how teacher be SDL, the Science, technology, engineering, and mathematics centre (STEM), an e-training workshop, the iEN National Education Portal, a qualitative Professional Development program and TAMKEEN (e-training focusing on teachers in schools) (Tatweer Co., 2019).

# 4 Theory

This work investigates Saudi CS teachers' PD vis-à-vis STCS standard, teachers' awards and Self-Directed Learning (SDL). The aim is to understand **how do Saudi Arabian CS teachers develop their teaching professionalism.** The new STCS has reformed teaching structure, policy and culture to encourage teachers to rethink their professionalism and ultimately change their PD and teaching behaviour.

In this work, an iterative model of teachers' development process has been created to understand CS teachers' pedagogical development. This thesis presents four sub-studies in which different aspects of this process have been explored with the aim of describing how and why teachers adopt changes in their pedagogy as part of their PD.

Behavioural change theories have been used to determine how and why CS teachers change their pedagogical practices. The existing literature mentions SDL as a strategy to fulfil teachers' need for knowledge and skills (McCartney, et al., 2016). In this work, CS teachers highlighted SDL as an efficient way of learning and development in their teaching careers. The theory of Adult Learning (TAL) has been used to understand the whole process of teachers' learning.

## 4.1 The Cycle of Pedagogical Development

A synthesis of the data from all sub-studies shows that the development of teachers' professionalism follows a cyclic process. The model is inspired by Guskey's model of teacher change (Guskey T. , 1986). In this model, change is described as a linear process. However, our data suggest that change happens in continuous iterations where each iteration feeds into the next. Figure 3 illustrates the process.

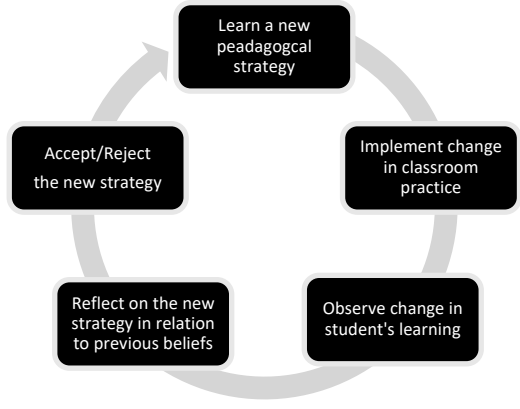


*Figure 3.* A model of pedagogical development

The steps of the process are as follows. First, teachers learn a new strategy, possibly motivated by external requirements such as the introduction of new regulations. Second, they employ the strategy. Third, they observe the outcome. Fourth, they reflect on the outcome in relation to previous pedagogical beliefs. In this step, teachers' pedagogical beliefs may change based on the new experience. Fifth, after reflection, teachers accept or reject the strategy depending on whether it is perceived to be beneficial. After completing one iteration, teachers continue to learn new strategies to adjust future teaching to the pedagogical beliefs they have developed.

Teachers are motivated to engage in and sustain the change process by internal factors, such as interest in teaching, and external factors, such as student outcomes and feedback. The development process can be directed by regulations making teachers learn and explore new strategies in their teaching. This was one of the aims of introducing the Saudi Teachers Competencies Standard (STCS).

## 4.2 Guskey's Model of Teacher Change

Guskey developed a model to study change in teachers. It illustrates the teacher change process occurring after participating in staff development programs (Guskey T. , 1986). The model suggests a transient sequence of events that is assumed to represent the process from formulation to lasting changes in the expectations and attitudes of students and teachers (see Figure 4).

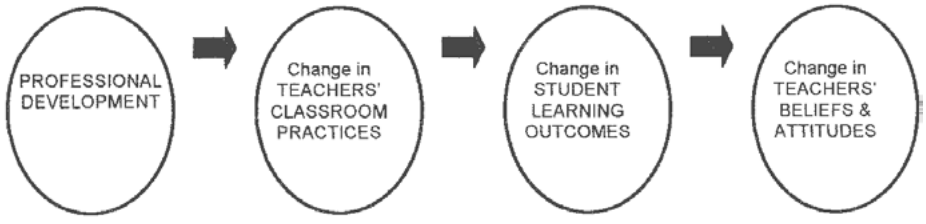


*Figure 4.* A model of teacher change (Guskey, 1986).

The main difference between the model of pedagogical development in Figure 3 and Guskey's model is that the former involves a linear progression instead of a circular progression. In addition, in the developed model teachers develop teaching based not only on student outcomes like in Guskey's model but also on self-concept, observing classes and following new regulations in their schools.

## 4.3 Beliefs and Practices

There is a growing awareness that the values held by individuals are the best predictors of the actions they will take in daily life (Bandura, 1986). In education, the literature indicates that teachers' classroom performance is influenced by their beliefs. The connection between beliefs and practices in teaching and learning is considered here. A review of previous literature on teachers' changing beliefs suggests that attitudes and beliefs both drive classroom actions and influence teachers' change process (Richardson, 1996). Two important factors lead teachers to make changes in their professional practice; these are motivation and experience (Guskey, 2002). In the research on teaching and learning, it is evident that teachers modify their pedagogy based on how successfully the implemented changes are perceived (Richards, Gallo, & Renandya, 2001). That is to say, teachers become comfortable in their current practices after they had experienced changes in their classrooms (Georgios & Karakiza, 2011) and (Lopez-Rosenfeld, 2017). Progress must be motivated by teachers' belief structures. Understanding how and why teachers change their educational beliefs based on Saudi society is the aim of this thesis. Regarding Computer Education Research it is important to clarify epistemology in computing because CS consists of abstract and practical topics (Matti & Pajunen, 2013).

## 4.4 Behavioural Change Theories

Behavioural change theories are presuming intention to take measures as a predictor of behaviour. The two most common of these theories are the Theory

of Reasoned Action (TRA) and the Theory of Planned Behaviour (TPB) and have been used to predict and explain a wide range of health behaviours and intentions (Paschal, William, & Alexander, 2017). They are also being applied in the educational context, particularly in relation to technology integration (Ertmer & Ottenbreit-Leftwich, 2010), PD (Ni, 2011) and innovative teacher behaviour (Vries & Gerrit, 2016) and (Williams & Hayler, 2015).

### 4.4.1 Theory of Reasoned Action

Fishbein developed Theory of Reasoned Action (TRA) based on social psychology research in 1967. The theory explains the relationship between human attitudes and behaviours. It is used specifically to determine how people will act based on their existing beliefs and behavioural intentions. The primary purpose of the theory is to understand the voluntary behaviour of an individual by examining the underlying basic motivation for carrying out an action. TRA states that the intention of a person to perform a behaviour is the main predictor of whether or not that behaviour is actually performed. In addition, the normative aspect (i.e. the social aspect) often relates to the actual performance of the action by the individual. The intent to perform a certain behaviour precedes the actual behaviour, according to the theory. This is known as behavioural intention and stems from an expectation that executing the action will result in a specific outcome. TRA suggests that better motives lead to increased commitment in executing the behaviour, which also increases the likelihood of performing the behaviour (Fishbein, 1976).

As we are looking for a relationship between beliefs and practices, TRA is suitable to predict change when we investigate the impact of STCS. In this thesis, this theory explains why STCS is one reason for CS teachers to develop their professionalism. It helps in categorizing the data from the first and second papers in this thesis, **Computer Science Teachers Perspectives on Competencies - A Case Study in the Kingdom of Saudi Arabia** and **Changing the Educational Epistemologies of Computer Science Teachers - A Case Study of the Kingdom of Saudi Arabia.** TRA guides the researcher in interpreting the interviews to understand why STCS motivates change.

### 4.4.2 Theory of Planned Behaviour

Ajzen proposed Theory of Planned Behaviour (TPB) to enhance the predictive power of reasoned action theory by including perceived control of behaviour. The theory has been applied to studies of the relationship between values, perceptions, behavioural desires and actions in fields such as marketing, public relations, advertising, health care, sports management and conservation. TPB is a philosophical concept that ties one's ideas to one's behaviour. The theory states that behavioural disposition, social norms and perceived behaviour together influence one's desires and behaviours (Ajzen, 1985).

As we are investigating teachers' awards as a way for CS teachers to grow and adapt their beliefs and practices, TPB is appropriate. In this thesis, the Behavioural Change Theories explains the preparation of CS teachers who apply for awards. They have to learn and apply pedagogy to meet the requirements of the competition.

### 4.4.3 Reasoned Action Approach

The Reasoned Action Approach (RAA) is used to illustrate the combination of the TRA and TPB. It is the newest version of Martin Fishbein and Icek Ajzen's theory and expands the earlier TRA and Expected Behaviour Theory (Fishbein & Ajzen, 2010). RAA is an integrative model for predicting or forecasting human social behaviour. TRA notes that behavioural expectations, perceived standards and perceived behavioural influence the intentions of individuals, while the intentions of individuals predict their behaviour. The RAA is illustrated in Figure 5.

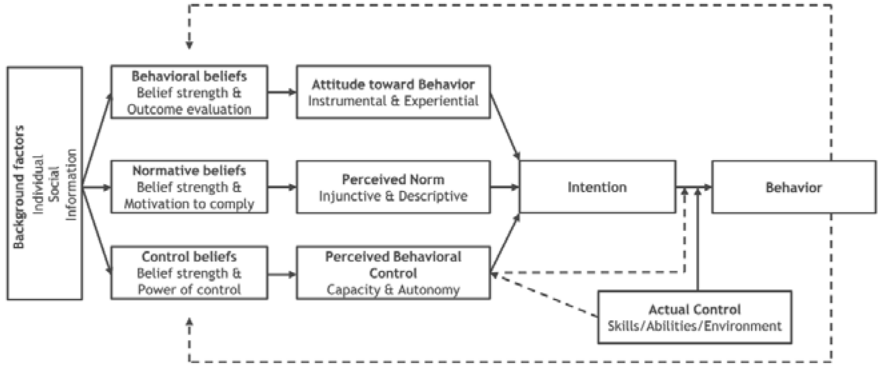


*Figure 5.* The Reasoned Action Approach (Fishbein & Ajzen, 2010)

RAA is used with the participants to interpret the change in teachers' pedagogy as a result of the STCS and teachers' awards. CS teachers prepare and read new strategies or express what they did in terms of behavioural beliefs related to the STCS or teachers' awards. They are then ready to adopt new beliefs even though they do not act on them yet (e.g. Teacher's License). Teaching CS is encouraging to be able to change some previous knowledge and adopt another in both CS and pedagogy. After CS teachers win or fail to win a competition or learn/implement new knowledge, they implement the new strategy in their teaching and accept/reflect some of the new teaching methods.

## 4.5 Theory of Adult Learning (TAL)

The goal of adult education is continuing professional development from teachers' perspective. Adults are resisting an education that does not match their self-concept as teachers and does not agree with their interests and experiences (Muller, 2004). The Theory of Adult Learning (TAL) developed by Knowles in 1968 explains how adults learn and lists five factors—self-concept, adult learner experience, readiness to learn, motivation to learn and orientation of learning. Knowles highlighted four central ways adults learn. First, adults (teachers in this case) should be involved in how their PD is planned. Second, they should see their experience (in teaching) as one input into PD. Third, they need to see evidence that the immediate strategy is suitable (for their students). Fourth, they must aspire to implement what they learn immediately (Knowles, 1978).

This theory relates to understanding the situation of adult learning as helpful in modifying PD programs. The theory helped the researcher explain some of the interview answers regarding teachers' current PD.

# 5 Methodology

This study deals with issues related to the professionalism of CS teachers in Saudi Arabia (SA) in light of recent research in computing education. The aim was to understand the motivations and things that influence CS teachers to further their pedagogical development in teaching CS. The fundamental premise of the model of pedagogical development is to answer the research question **How do Saudi Arabian CS teachers develop their teaching professionalism?**

In this thesis, CS teachers' teaching experiences are seen as a whole, and several studies were carried out to disentangle these complex experiences. Three studies contribute the empirical grounds upon which the results are based. The researcher reports on the issue of changing educational beliefs through PD from three different perspectives. The first perspective relates to STCS, upon which the first and second papers are based. The second perspective relates to teachers' awards, upon which the third paper is based. The third perspective relates to SDL, upon which the fourth paper is based (see Table 1).

*Table 1*. The study methodology format

| N | The Case Study Title | Named | Type of method | Research | Type of data analyses |
|---|---|---|---|---|---|
| 1 | Computer Science Teachers' Perspectives on Competencies – A Case Study in the Kingdom of Saudi Arabia | STCS Study | Structured Interview | Qualitative | Thematic Coding Analysis |
| 2 | Changing the Educational Epistemologies of Computer Science Teachers – A Case Study in the Kingdom of Saudi Arabia | Change Study | | | |
| 3 | Teachers' Awards – an Incentive for Pedagogical Development in Saudi Arabia | Award Study | | | |
| 4 | Why Computer Science Teachers in Saudi Arabia Learn on Their Own: Impulse for Self-Directed Professional Development in CS Teaching | SDL Study | Questionnaire | Quantitate | Statistics Analysis |

The first paper in this thesis is **Computer Science Teachers' Perspectives on Competencies – A Case Study in the Kingdom of Saudi Arabia** (referred to as the STCS Study). The empirical data was collected via interviews with 10 CS teachers concerning the new standard of teaching (STCS) and their views on this standard as CS teachers.

The second paper is **Changing the Educational Epistemologies of Computer Science Teachers – A Case Study in the Kingdom of Saudi Arabia** (referred to as the Change Study). Data was collected via interviews with 13 CS teachers regarding changes in their educational pedagogy during their teaching careers.

The third paper is **Teachers' Awards – an Incentive for Pedagogical Development in Saudi Arabia** (referred to as the Award Study). Empirical data was collected via interviews with 14 CS teachers who previously won a teacher's prize after engaging in one year of PD. The focus of the discussion is on what changes they made before, during and after they were awarded the prize.

The fourth paper, **Why Computer Science Teachers in Saudi Arabia Learn on Their Own: Impulse for Self-Directed Professional Development in CS Teaching**, focuses on support for SDL. Data was collected via a survey sent to 352 CS teachers with questions based on SDL as a strategy to learn new pedagogy.

## 5.1 Mixed Methods

Mixed-method studies promote the mixing of quantitative and qualitative research within an ongoing study (Creswell, 2016). This includes not only statistical data widely used for quantitative research but also text data that is standard for qualitative research to answer the research questions identified for a particular research study. There are six strategies for mixed methods; of these, the exploratory sequential design works best in this thesis where the research is distinguished by an initial phase of collecting and evaluating qualitative data followed by a phase of gathering quantitative data. The results are incorporated during the analysis process. The primary focus is on exploring a phenomenon. The goal of the researcher is to use the mixed methods approach to draw on the strengths and minimize the weaknesses of approaches to quantitative and qualitative research. Scientists are now able to test and construct hypotheses by having the ability to design research studies that incorporate data collection and data analysis methods used in approaches to quantitative and qualitative research (Robson, 2011). The mixed-methods approach in this study allowed comparing the results and understanding CS teachers' changing beliefs about teaching practices. The data collected from the survey support the data from the interviews. The researcher wants to examine CS teachers' perspectives in depth using a mixed-methods approach. The participants in the first three papers in this study answered the interview questions based on their experiences, practices, feelings and thoughts related to their experience teaching CS. However, in the fourth paper participants answered the questionnaire. The results are detailed in the discussion section.

## 5.2 Interviews

Interviews have also been used as a main data collection method to gather information about individuals' practices, beliefs and opinions. The interviews provide a depth of data, while also allowing the researcher to present a big picture and, through the participants, to understand CS teachers' view regarding changes in CS teaching. The interviews were conducted via e-mail and telephone and face to face. Structured interviews allowed the collection of responses to compare and contrast. The questions were open-ended and related to participants' background in CS teaching and their expectations regarding their future careers. The structured questionnaire consists of a large number of interview questions extensively informed by the existing literature on the subject matter and by the research question. The interview protocol for all studies is found in Appendix 1.

## 5.3 Questionnaires

The questions are answered in a set format. Open-ended question requires respondents to formulate their own answers, whereas closed questions merely require respondents to select an answer from a range of options. The answer choices should be extensive and mutually exclusive for a closed-ended query (Foddy, 1994).

Personal experience and previous literature were used as a basis in designing an appropriate questionnaire for CS teachers in SA. For the fourth paper, a questionnaire with 42 items with a five-point Likert scale was developed (see Appendix 2). The questionnaire is based on the scale to measure learners' self-directedness in the workplace (Kenneth, 2008), with modifications based on the results of previous studies.

## 5.4 Data Analysis

Thematic coding is one of the most common forms used in qualitative research analysis. It emphasizes the detection, evaluation and interpretation of patterns of meaning (or 'themes') (Braun & Clarke, 2006). This method is used in the first three papers. The researcher found the categories of CS teachers' teaching that CS teachers practices in the Saudi Arabia. The thematic coding analysis consists of five steps, which are becoming familiar with the data, generating codes, identifying themes, constructing thematic networks and interpreting the results (Robson & Kieran, Thematic Coding Analysis, 2016). All five were applied to an extent to identify the themes. The researcher next created categories based on multiple readings of the original text. The definitive, quantitative study was conducted to confirm the links and relationship between the

data obtained in the qualitative studies. For the fourth study, statistical analysis using the package program SPSS was used.

## 5.5 Participants

In this thesis, the community consists of CS teachers in SA, who number 12,552 (The General Authority for Statistics, 2019). The total number of participants in this study is 389 CS teachers. They live in different cities in SA and have different years of experience. The male teachers' number 265, and the female teachers' number 124 (see Table 2).

*Table 2.* Participant distribution

| N | The Study Title | Participants | | |
|---|---|---|---|---|
| | | Male | Female | Total |
| 1 | STCS Study | 10 | 0 | 10 |
| 2 | Change Study | 8 | 5 | 13 |
| 3 | Award Study | 6 | 8 | 14 |
| 4 | SDL Study | 241 | 111 | 352 |
| Total | | 265 | 124 | 389 |

## 5.6 Ethical Considerations

The researcher conducted this study in schools in SA and followed all ethics procedures mandated for Swedish and Saudi Arabian research environments. Approval was obtained from the Saudi Ministry of Education (see Appendix 3). The teachers were informed about the purpose of the research and about seeking help from the Ministry of Education to distribute the research questionnaire to all CS teachers on its mailing list. To increase the number of participants, the interviews and questionnaires was sent to the CS teachers' community via an informal platform, such as Twitter and Telegram. As part of complying with research ethics, the questionnaire details on the first page state the purpose of the study and the optional participation of the respondents. It also states that the data will only be used for scientific research.

# 6 Results of the Sub-studies

Teachers have initially been motvited to participate in Professional Development (PD) due to their belief that it would expand their knowledge and skills and increase their effectiveness with students. In this section, the researcher presents each study and explores the aims and main results that contribute to the body of this thesis. The research question is **How do Saudi Arabian CS teachers develop their teaching professionalism?** This question was divided into four sub-questions:

1. How are teaching competencies achieved and controlled, and what help is available to support teaching CS competently in SA?
2. How and why do CS teachers adopt new educational beliefs in their pedagogy?
3. How have K–12 CS teachers in SA changed their pedagogy as a result of one year of PD experience leading up to winning a teacher's award?
4. Why CS teachers were influenced by self-directed professional development in CS teaching?

## 6.1 Paper I

The STCS Study is presented in the paper **Computer Science Teachers Perspectives on Competencies - A Case Study in the Kingdom of Saudi Arabia**. The study investigates how teaching competencies are achieved, how they are controlled and what help is available to support teaching CS competently in SA. The results were structured into three main categories—Connection to Society, Professional Practice and Professional Development (see Table 3).

*Table 3.* Summary of the STCS Study results

| N | Category | Themes | Examples |
|---|---|---|---|
| 1 | Connection to Society | Culture | Arabic language<br>Islamic values |
| | | Context | Student<br>Teachers<br>Charity |
| 2 | Professional Practice | Need for technical infrastructure | Equipment<br>Maintenance |
| | | Teaching approaches | Active learning<br>Student-centric<br>Focusing on the practical |
| 3 | Professional Development | Formal requirements | Teacher's license<br>Self-directed learning<br>Students' needs |

These categories correspond to the classifications referenced in STCS to a significant degree. The fundamental distinction lies in the Professional Development category, where the teachers experience SDL as the primary strategy for the necessary training and skill advancement. They report spending a significant part of their work time on this kind of learning. However, SDL is not considered as a preferred mechanism to teachers in the STCS standard. A summary of each category follows.

1. Connection to Society:

The first category deals with the CS teachers' teaching experiences in relation to their immediate circle of society. During the empirical study, the focus was on the CS teachers' teaching experiences. This category demonstrates how teachers speak about the relationship between CS education and society. Culture plays a significant role in Saudi society. For example, the Arabic language and Islamic religion are strong elements of culture among CS teachers in SA. Therefore, education—including CS education—and society relate to one another in a cultural and contextual way.

2. Professional Practice:

The second category is professional practice, meaning issues relating to participants' actual teaching practices. Based on the participants' narratives, two main factors are associated with professional practice—technical infrastructure and approaches to teaching. Participants stated that there is a gap between how they were taught at university and how they teach CS today.

3. Professional Development:

The third category is the Professional Development (PD) of CS teachers. The participants' narratives suggest a relationship between PD and some specific activities, such as the CS teachers' test, teacher' license, performance

indicators for teachers, special course preparation (Computer Teachers for the New Curriculum) and book recommendations for teachers. They referred to a kind of assessment that teachers should pay attention to and stated that success is necessary to attain a pass in these exams.

The contribution of this study is bringing to light what CS teachers are currently teaching well, thus helping to improve STCS standard and build a PD program that addresses the current training needs of in-service CS teachers.

## 6.2 Paper II

The Change Study is presented in the paper **Changing the Educational Epistemologies of Computer Science Teachers - A Case Study of the Kingdom of Saudi Arabia.** The Saudi Ministry of Education encourages teachers to improve their practices to meet the new quality specifications for education. This paper shows the results of an examination of CS teachers' views on changes in educational beliefs in Saudi schools. The paper discusses how and why CS teachers adopt new educational beliefs in their pedagogy. The empirical results were structured into six categories: SDL, Personal Pedagogical Beliefs, Peer Learning, Student Feedback, Curriculum and STCS (see Table 4).

*Table 4.* Summary of the Change Study results

| N | Category | Themes | Examples |
|---|---|---|---|
| 1 | Self-Directed Learning | Teaching method | Internet<br>Workshop<br>reading |
| | | Self-reflection | Compering<br>Role model |
| 2 | Personal Pedagogical Beliefs | Traditional | Deliver the information<br>Lecturing |
| | | Constructivist | Student's teacher<br>Try and fail<br>Gamification |
| 3 | Peer Learning | Formal | Workshop<br>Mentoring |
| | | Informal | Social media platform<br>Internet |
| 4 | Student feedback | Individual differences | Immediate feedback<br>Student centre |
| 5 | Curriculum | Theoretical | New content<br>Attending in-service |
| | | Application | Mobil development<br>Augmented reality<br>Project work |
| 6 | STCS | External | Teacher's license |
| | | Internal | Professional development |

The study highlighted the outcomes of each category, as follows:

1. Self-Directed Learning (SDL):
The research shows that teachers participate in SDL in PD to keep pace with a particular area of knowledge. A significant percentage of the participants surveyed stated that SDL is a way to improve their epistemology of education and acquire necessary knowledge and skills. Essentially, CS teachers stated they could only be effective if they update their knowledge in line with the present reality.

2. Personal Pedagogical Beliefs:
At the beginning of their career journey, the participants see themselves as traditionalists, and with a few years of teaching experience, they see themselves as constructivists. That is to say that their personal pedagogical beliefs change with practical experience.

3. Peer Learning:
Discussions with colleagues and learning from each other has been found to be one of the factors influencing teachers to make changes in the epistemology of learning.

4. Student feedback:
Student feedback is an important influence on potential changes in the academic epistemology of educators. The participants said that their decision to adopt new pedagogy is motivated by positive feedback from students on any new teaching method or instrument.

5. Curriculum (new CS subjects):
The participants noted that the new curriculum contributes to in-service learning that encourages them to change their educational epistemology and develop it.

6. STCS standard:
The STCS was seen as an external motivation leading the participants to change how they teach CS. CS teachers said the STCS requires more commitment and workload than necessary. STCS is perceived as non-inclusive; practicing teachers are not sufficiently represented in the STCS implementation. CS teachers said the STCS is a good starting point for new teachers, but more training and support is needed for teachers who are already advanced in their teaching career.

The contribution of this study is that it reveals a weak relationship between the STCS norms and educational epistemological change. The STCS should provide supervision for CS teachers about how to keep advancing their

epistemological ideas regarding teaching CS. Also, the STCS should offer official resources for CS teachers.

## 6.3 Paper III

The Award Study is presented in the paper **Teachers' Awards - an Incentive for Pedagogical Development in Saudi Arabia**. This study seeks to understand how K–12 CS teachers in SA have changed their pedagogy as a result of one year of PD experience leading up to winning a teacher's award. The results show that a teacher's award inspires CS teachers to change their pedagogical practices. It is another way of growth career among the CS teachers (see Table 5).

*Table 5.* Summary of the Reward Study results

| N | Category | Themes | Examples |
|---|---|---|---|
| 1 | Rewards | External/internal | Motivation<br>Reputation |
| | | Matching interesting | Development<br>Good teaching |
| 2 | Professional Development | Confidence | Learn from failure<br>Experience |
| | | Performance | Teaching methods<br>Encouragement from others |
| | | Self-directed learning | Peers<br>Internet |
| 3 | Student Outcomes | Active learning | Flipped classroom<br>Projects |
| | | 21st century skills | Solve problem<br>Collaborating |
| | | Teaching practice | Learn from students |
| 4 | Contributing to a Teaching Community | Documented | Personal experience |
| | | | Profile |
| | | Reporting | Published |
| | | | Participating |

Initially, the CS teachers wanted to be recognized. Yet, they are still learners, aiming to develop professionally and acquire up-to-date knowledge in their field. There are four categories the empirical study associated with teachers' awards in relation to pedagogical development in SA. These are listed below.

1. Rewards:

A reward is one factor influencing change in pedagogical development. According to some of the participants' reflections, this is done implicitly. CS teachers are interested in awards and are in a mindset of pedagogical advancement that supports their career development.

2. Professional Development:
Participants stated that competition for an award directly or indirectly encourages PD. The process of award nomination needs to be clarified. Nonetheless, the award promotes SDL, which leads to PD. This suggests a linear relationship between the award and PD.

3. Student Outcomes:
The participants said the award application process stimulates innovative and creative ideas regarding teaching methodology that could have a positive impact on student outcomes.

4. Contributing to a Teaching Community:
CS teachers are inspired enough by the recognition and prestige associated with the award to apply for it. This is because it is the duty of the award winners to support colleagues and to maintain expertise in computer education.

The contribution of this study is that it highlights the need for the Saudi Ministry of Education to simplify the criteria and conditions of teaching awards and to offer workshops and resources to explain the whole process.

## 6.4 Paper IV

The SDL Study is presented in the paper **Why Computer Science teachers in Saudi Arabia Learn on Their Own: Impulse for Self-Directed Professional Development in CS teaching.** This study is different from the previous studies because it is based on quantitative research, and a significant amount of data was collected from the participants. The study shows that female CS teachers are more involved in SDL than male CS teachers. The respondents agreed on the total average score of workplace self-directedness of learners and self-reflection, preparation, explanations and PD for CS educators. CS teachers are willing to adopt change in pedagogy in school if the change process includes features of adult learning and the Reasoned Action Approached (RAA). Teachers need to be involved in their PD and to be able to plan their own PD. They want to integrate their experiences into new training programs. Teachers also want to implement whatever knowledge they acquire immediately. Teachers' requirements regarding PD differ from those described by the Ministry of Education.

The contribution of this study is the finding that female CS teachers are more engaged in SDL than male CS teachers. In addition, the study identified many factors influencing CS teachers to adopt SDL such as self-reflection, planning, reasons and PD. The study also implies that PD should consider CS teachers' needs in terms of resources.

## 6.5 Summary of the results

The first sub-study employed the Theory of Reasoned Action (TRA) in the developed model to investigate why CS teachers learn a new strategy. The second sub-study was more focused on how teachers makes changes. The third sub-study looked at teachers' awards and employed the Theory of Planned Behaviour (TPB) in examining how and why teachers change. The fourth sub-study was undertaken to understand how the learning process can explain teachers' differences in using the strategy of Self-Directed Learning (SDL). How professionalism in CS teaching has been achieved was interpreted using ALT (see Figure 6).

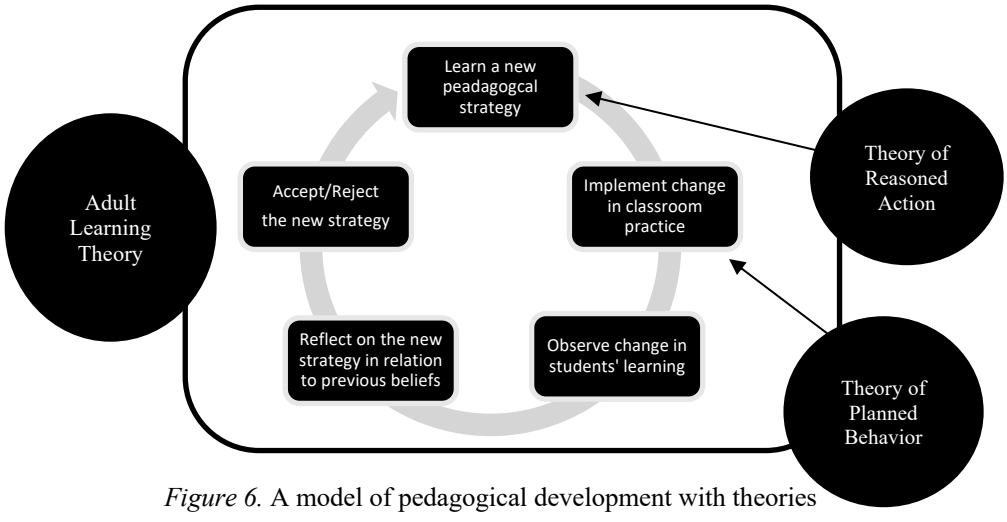


*Figure 6.* A model of pedagogical development with theories

CS teachers gain more knowledge and skills from PD programs. The assumed outcome is changes in teaching practices in the classroom and in students' learning outcomes. Therefore, after the successful implementation of the new approach in teaching CS, teachers' beliefs are expected to change. An alternative model that re-considers the process of teachers' change is needed to provide teachers with more effective PD programs. The studies included in this work shows that CS teachers are influenced by the regulations (such as the STCS) and they are engaged in competitions (such as teachers' awards) to fulfil the requirements of PD or to be recognized as expert teachers. Teachers have their own specific way of learning, which means policymakers need to redesign PD programs.

Teachers are assumed to prepare PD towards the requirements of the teaching standard or teachers' awards by self-directed learning (SDL) strategy. Teachers were proven how and why they fulfil the STCS, eligible to apply for teacher's awards.

# 7 Discussion

Educational pedagogy in CS refers to practices in teaching methods or in other words, strategies to teach CS. This thesis relies heavily on the data collected from the sample of 389 CS teachers regarding their daily teaching practices. Data was collected via structured interviews and a questionnaire. We observed changes in CS pedagogy based on STCS standard, teachers' awards and Self-Directed Learning (SDL). It is evident in the research that CS teachers change their pedagogical development after the successful implementation as was proven in the study by (Richards, Gallo, & Renandya, 2001).

The Reasoned Action Approach (RAA) and the Theory of Adult Learning (TAL) have been used to predict and explain the changes that CS teachers have made. Based on the data, we can say there are two classes of CS teachers, novice and experienced teachers, that have overlapping motivations and regulations. We can say that CS teachers differ in terms of the actions they take based on changing educational beliefs.

## 7.1 Changing Practices for Novice Teachers

In this study, novice teachers are defined as teachers who have five years or less of teaching experience; they are at the beginning of their teaching careers. They have good theoretical education but lack all the required skills to teach CS. They are motivated to put into practice what they have learned. They are often afraid to stand in front of students and fail to fulfil the instructional requirements.

Novice teachers are highly motivated because they are at the beginning of their careers. They try hard to impress both students and supervisors with the best teaching methods they have learned. Even though the motivation is internal, the regulations and policies of the Saudi educational system, such as STCS, push them towards becoming better qualified teachers. CS teacher N said:

> I believe that the teacher who motivates by any honour is motivated by the change for the better. Motivation is a means that drives the teacher to the top and makes him look for development and the best, especially in the field of computer in which the specialization is renewed, and science is advanced.

Concerning Professional Development (PD), CS teacher P stated:

> The change of students and their development no longer suits them traditional methods ... In addition to the results of recent studies, which proved the effectiveness of modern teaching methods in achievement and understanding of students.

Concerning STCS, CS teacher Q stated:

> I expect STCS to add a good value to the existence of teaching value. The important thing is that curriculum should be in line with the time-reality and with the requirements of the Teachers' License.

In the current Saudi educational system, the requirements to become a teacher are high. The system does not seem to encourage or motivate qualified individuals to become teachers. The authorities have had these stringent conditions in place for a very long time. CS teachers are expected to pass a national test for teaching competencies and a CS teacher exam using the SDL strategy. SDL sometimes only covers some aspects of the exam, and CS teachers have noted a gap between what they have studied and what the real career environment requires. Novice teachers therefore use the SDL strategy to a greater extent to fill the gap. Regarding STCS, novice CS teachers can motivate themselves with SDL to develop and change their educational teaching beliefs. For example, CS teacher Q said:

> In the first year, it was difficult. I worked hard, for example, standing in front of students and instruct knowledge required hard work. Day by Day, I was able to overcome my fears. I was fond of using a lab to solve problems. Today, professional development is speedy and CS teachers need hard work to bridge this gap. However, my self-confidence has been improving in front of my students. I have been teaching K9 students the Visual Basic program language that I took in the last level when I was in college.

## 7.2 Changing Practices for Experienced Teachers

Experienced teachers are defined as teachers with more than six years of teaching experience. They have employed many teaching strategies over time, and what they have taught and what the students need align. Some experienced CS teachers view teachers' awards as a stable method that helps them to change and adopt new strategies. This is possible because it is an outcome of their own experience and community evaluation. For instance, CS teacher S said:

> I like the profession of education, and I like to bring in innovation in terms of ways and methods of teaching. I am happy whenever my innovation becomes

> successful. I have found some ideas and works worthy of participation; I see them as psychological motivation and self-satisfaction. This is enough for me to participate in such competitions and through which I am able to challenge myself, win, and be on the podium…. In addition, I use the self-learning method to help students to learn independently according to their skills.

CS teachers are not motivated by the STCS because they feel they were ignored in the design of the STCS. Despite this, they suggested that the Ministry of Education should increase awareness about the implementation of the standard. The teachers also pointed out the need for technical infrastructure that was not covered by the STCS. The CS teachers suggested both the need for equipment and the timely and routine maintenance of such equipment. They also suggested the need to employ maintenance personnel. This is because the status quo is that the maintenance of equipment is done by the CS teachers, and this has a negative impact on their primary teaching duties. It is essential to note that when the STCS gives directives regarding CS teachers' duties, it does not include the maintenance of technical infrastructure or the necessary PD needed for this. However, CS teachers prioritize SDL to develop themselves professionally. Regarding teachers' awards, CS teacher Z said:

> It is necessary to set up some workshops in schools in order to introduce these awards, the method of application and identification of the required documents to be presented for the award, in addition, the awarding body should provide a set of incentives for the teacher as an initial motivation before submission because sometimes teachers ask themselves what is the benefit of the award?

Experienced CS teachers feel qualified to participate and show other colleagues what CS expertise they possess. CS teacher T said:

> The evidence and pedagogical practices required in the standard is available to me and reinforce the teacher's efforts. The motivation was not the prize itself but an organized effort.

Many studies agree and support to involve students in their learning, such as (Lopez-Rosenfeld, 2017) and (McCartney, et al., 2016). However, the education system requires teachers to engage in their PD. The thesis submits that teachers' voices are missing in PD programs. Although the PD program is designed for them, they feel ignored. For example, in the STCS, it says 10,000 teachers were involved, but this only represents 2% of the teacher population in SA, which is 519,000 (Education Evaluation Commission, 2017). It is essential to note that teachers are at the base of the education system, yet they could not offer their opinions and advice. If the authorities need to implement a new tool or system seamlessly, teachers must be involved.

In SA, students spend a minimum of 12 years in school, while teachers remain in the education system for at least 25 years. Thus, teachers require significant consideration by the authorities. The process of achieving the

desired future goals takes a long time and a great deal of commitment from all stakeholders.

There are established change processes in SA organized in a pyramidal hierarchical structure. This means that change can only be initiated at the top. Therefore, for effective results, teachers who is on the pyramid base must not be underestimated and must benefit from their experiences.

All in all, novice and experienced teachers are influenced by the STCS, teachers' awards and SDL to adopt change in their educational beliefs during their teaching journeys. This is the result of both internal and external motivation.

# 8 Conclusion

This thesis investigates how CS teachers change their educational pedagogy in teaching CS in schools in SA. The STCS is newly introduced standard in the Saudi education system. The researcher acknowledges that the number of CS teachers interviewed and the number of questionnaires responses were limited; however, the responses were meaningful enough to make a scientific conclusion. The results reveal important issues regarding the teachers' PD. The outcomes of this study were analysed using a mixed-methods approach to address the study research questions.

This thesis reveals the understanding of CS teachers regarding teaching CS and what challenges they faced in the classroom. It reveals what they are facing in changing their pedagogy in the context of controls placed by the Ministry of Education in SA.

The STCS, teachers' awards and Self-Directed Learning (SDL) guided novice and experienced teachers to change their learning values during their teaching journeys. This is due to internal motivation and external regulations. CS teachers' demands, practices and how they can apply the theories of learning in CS teaching. Sequential stages must be acknowledged when the educational authorities plan teachers' PD. There is a gap between what CS teachers learned during their university education and what they teach today. Therefore, CS teachers should be trained in both core CS and pedagogy. Moreover, CS teachers' perceptions regarding training programs should be analysed. The data could help with existing in-service programs and in planning future training programs. This study suggests that the educational authority in SA needs to listen to teachers to maintain and improve the quality of PD. It also suggests that the narrative of teachers regarding changing educational beliefs could provide valuable information to evaluate and promote education policies such as STCS, teachers' awards and teachers' experiences in SDL.

The thesis suggests strong collaboration between the universities and the Ministry of Education is necessary for the efficient implementation of targeted changes. It also suggests the Saudi authorities should evaluate all training programs for CS teachers to better understand their role in achieving the target goals and objectives.

# 9 Contribution

The author is convinced it is necessary that CS teachers should experience personal agency in the decision-making process regarding their PD. Teachers are aware of their needs and can offer valuable advice on how to meet them. They are also well equipped to evaluate the implementation of changes in their teaching activities. If they receive immediate feedback, they tend to adapt and change their strategies to ensure a more nuanced educational experience for their students.

Education providers should involve expert teachers as ambassadors in the process of implementing theories of change, especially those that correspond to changes in educational beliefs in regard to disciplinary-specific conceptual material.

This study provides a model of pedagogical development developing a series of theories with which we can both analyse and understand how teachers adopted a new pedagogical strategy after the successful outcome of a PD experience.

The study identifies that a single overarching PD program for all teachers of all different backgrounds, and from all regions, is too generic to be fully effective. There should be different programs based on personal needs and SDL. Each teacher should be able to choose the program that best meets their needs. The educational authorities should take this into account in future program designing.

Improved outcomes and enhanced career performance motivate teachers to attend PD programs, but that does not mean teachers will benefit from them. That is, many PD programs do not address the specific needs of teachers. Some CS teachers do not attend in-service training programs or are not interested in the material covered in these programs because it does not meet their needs. Teachers should be involved in planning their PD. Professional Development programs should be easy to implement, connected to daily teaching expectations and should be based on existing teaching problems. The author find that some CS teachers feel forced to gain points as a PD requirement due to the STCS standard. If PD is presented in a better way, it should be linked strongly to the effectiveness in the classroom, it might help teachers to adopt new pedagogy.

# 10 Future Research

There are many researchers who study to continuing this investigation, for instance, the findings to date make it imperative to conduct further studies of CS teachers extending the context in order to explore and contrast global practices PD and in teaching and learning CS from a multi-national perspective. This will assist in disseminating good practices in CS teaching with the objectives of identifying and adopting the best global practices.

This study has investigated CS teachers in schools, applying the model of pedagogical development and change strategies to tertiary education could bring other experiences to the fore.

Notably, this research does not consider CS teachers who, while they might have failed to win a teacher's award, nonetheless gained a lot of knowledge. When they try to win a teacher's award this also heralds a change in attitude and pedagogical ambition, and this, in turn, imparts meaning to their teaching activities. Therefore, as another future direction, the researcher will research what initial changes they made due to the decision to compete for the award, despite the ultimate outcome.

Finally, the author will continue to expand my network, work with the global computing education research community and prepare to participate in upcoming FIE and other conferences. The researcher also looks forward to presenting my current work to the new National Institute for Educational Professional Development in SA. In particular with a focus on investigating the implementation of the STCS from the perspective of teachers.

# 11 Summary in Swedish

I Saudiarabien lanserades 2017 en plan för att reducera Saudiarabiens ekonomiska beroende av olja och istället skapa en mer varierad ekonomi och utveckla områden som hälsa, utbildning, infrastruktur och turism. En viktig komponent i planen är en ny standard som reglerar lärares kompetens och profession. Denna avhandling utforskar saudiarabiska datalärares syn på motivation och medel för deras professionella kompetensutveckling från tre perspektiv: (1) effekter av nya regelverk, (2) priser och utmärkelser som drivkraft för kompetensutveckling samt (3) kompetensutveckling genom självstudier. Den centrala forskningsfrågan är ”Hur utvecklar saudiarabiska datalärare sin professionella kompetens?”

Resultaten bygger på fyra delstudier där intervju- och enkätdata analyserats med blandade metoder, dvs både kvalitativa och kvantitativa metoder. I studierna deltog 389 datalärare verksamma i olika städer i Saudiarabien. Deltagarna varierar även i undervisningserfarenhet och övrig demografi. Analysen bygger på ett teoretiskt ramverk som integrerar element från två beteendeförändringsteorier (the Theory of Reasoned Action och the Theory of Planned Behaviour) samt teorin om vuxnas lärande (the Theory of Adult Learning). En modell som beskriver hur lärare utvecklas pedagogiskt har tagits fram och används för att förklara hur och varför lärare införlivar nya pedagogiska strategier i sin undervisning.

Datavetenskap är ett ämne under snabb utveckling vilket ställer höga krav på att lärare inom ämnet utvecklar både sin ämneskompetens och sin pedagogiska kompetens. Studierna visar att både interna och externa faktorer motiverar försöksdeltagarna att engagera sig i kompetensutveckling. I den saudiarabiska modellen utgör priser och utmärkelser externa faktorer vilka innefattar en förberedande period av intensiv kompetensutveckling. Exempel på lärares erfarenhet från denna kompetensutveckling ligger till grund för den bild av saudiska lärares fortbildning som redovisas i avhandlingen.

I flera av delstudierna angav försöksdeltagarna att de främst använde självstudier för sin kompetensutveckling. En orsak till detta var att de upplevde att många av de kompetensutvecklingsprogram som erbjuds brister i aktualitet och relevans. En slutsats är att fortbildning bör utformas i dialog

med lärarna samt att stöd för självstudier med möjlighet till individuell anpassning behövs.

De studier som ligger till grund för avhandlingen har genomförts i Saudiarabien men resultaten ger även insikter rörande generella utmaningar förknippade med reglering av lärares kompetens och utformning av fortbildning för lärare. Resultaten pekar tydligt på vikten av lärares delaktighet i utveckling av professionen för att förändringar ska accepteras och införlivas i deras yrkesgärning. Studierna visar att teorier för beteendeförändring kan användas för att förstå och förutspå hur nya regelverk och pedagogiska strategier mottages, om de kommer att accepteras eller avvisas av lärare. Dessa teorier utgör därför en användbar grund för förståelse och styrning av undervisning och lärarprofessionen.

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# 14 Appendix No. 1

## 14.1 Paper I (Interview)

The aim of the study is to determine what competencies in the teaching of CS that CS teachers in the KSA have.
The competencies I will investigate in this study are based on the CS Teachers' Competencies Standard in the KSA.
The research question is 'What competencies in teaching CS do CS teachers have right now in relation to the STCS?'

The Saudi Teachers Competencies Standard (STCS) consists of eight interrelated standards grouped into three overlapping areas:

- The teaching profession, namely professional values and responsibilities.
    - Islamic values and Saudi culture in the education process.
    - Professional interaction with educators and society.
- Professional knowledge
    - Know the students and how to teach them.
    - Know the content of the specialization and curriculum.
    - Know the teaching methods.
- Professional practice
    - Planning and applying learning and teaching units.
    - Creating the interactive learning environment and conservation.
    - Evaluating the students.

**First: Personal information**

- What is your name?
- How old are you?
- What is your academic major and degree? When? Where?
- What grade do you currently teach?
- Where is your school?
- How long have you been teaching?
- What is your grade for the CS teacher test? How many times did you take it?

**Second: The teaching profession**

Outline of topics to be addressed in the interview.
**Part A**: Main issues to be addressed regarding **the teaching profession**:

1. What do they think counts as 'good teaching?'
2. What are your students' expectations regarding learning CS?

If nothing is said about the teachers' values or cultures*:* What is your indirect goal in teaching CS?

3. Do you prefer to teach CS in Arabic or English? Why?
4. What do you expect from your students in terms of contributing to society?
5. What is the important thing for CS teachers in the long term?

   If nothing is said about the professional development: What is your opinion about teaching licenses? Or should teachers continue learning?
6. How do CS teachers learn from professional education communities, both formal and informal?
7. What is your definition of competencies in teaching CS?

**Third: Professional knowledge**

Outline of topics to be addressed in the interview.

**Part B**: Main issues to be addressed regarding **professional knowledge**:

1. What grade are you teaching? Do you think there is any need for special care? Why?

   If nothing is said about the physical, mental and emotional growth: Do you think the adolescence will affect students' learning? How?
2. Could you tell me your experience in teaching CS in the first year and now? What changes did you make? How did you do it?
3. Do your students enjoy the CS class? How? Why

   If nothing is said about the engagement: Do your students apply what they have learnt?
4. If you had a scenario in CS (a new concept to teach, i.e., enhanced reality), what is your strategy to teach it? Why?

   If nothing is said about the teaching methods: What are your strategies to teach CS? Why?
5. How are your students assessed in theory and practice?

**Fourth: Professional practice**

Outline of topics to be addressed in the interview.

**Part B**: Main issues to be addressed regarding **professional practice**:

1. I would like you to think back to the last lesson that you were especially pleased with. What happened that day that made you satisfied with the lesson? If I had been observing your class that day, what would I have seen?

   If nothing is said about the plan to teach the lesson: Did you have a plan you followed? Why?
2. Now try to recall an event that you were especially disappointed with. What happened that day that disappointed you?
3. Suppose you were in the middle of a lesson in (programming) and a student said, 'This is boring. Why do we have to learn this?' What would your answer be? Why?
4. What kind of teaching tools you do prefer to use in your class? Why?

   If nothing is said about the students' motivation: What would make the students like to learn CS? Why?
5. How do you help your students effectively with feedback?

6. As you are an expert in CS teaching, what are your recommendations for novice CS teachers to increase their competencies in teaching CS?

Thank you for the valuable information. Is there anything else you would like to add?

## 14.2 Paper II (Interview)

The goal of this study is to investigate teachers' changing educational beliefs about teaching CS in the KSA in relation to the new standard (STCS).
The interview consists of two parts; one concerns background information and the other concerns educational beliefs about teaching CS.

**First Part:**

- What is your name?
- How old are you?
- What is your academic major and degree? When? Where?
- What grade do you currently teach?
- Where is your school?
- How long have you been teaching?
- What is your grade for the CS teacher test?

**Second part:**

- Briefly describe how you are teaching CS.
- Could you tell me your experience in teaching CS in the first year and now? What changes you have made? How did you do it?
- What is essential for you to teach CS or for student understanding? Why?
- Do you have a particular strategy to teach CS? What is the process?
- In your opinion, what does good teaching in CS mean to you?
- Have you heard about STCS? What is your opinion? How will it affect your teaching?
- Describe some of your teaching approaches (active learning, student-centric learning, etc.).
- What tools (e.g. group work, projects, profile) are you using?
- How are you using information and communication technology (ICT) when you are teaching CS?
- What factors influence you to change your educational beliefs in teaching CS today?
- Who should lead changes in educational beliefs? Why?
- What are the motivators of change for you? Choose up to three.
    - Supervisor feedback
    - Student feedback
    - Collaboration with colleagues
    - Self-directed learning
    - Curriculum
    - Attending in-service programs
    - Preparing for the teacher's license
    - Others

Thank you for the valuable information. Is there anything else you would like to add?

## 14.3 Paper III (Interview)

The goal of this study is to investigate teachers' changing educational beliefs about teaching CS in the KSA in relation to teachers' awards (the Teacher's Award, a national award in the KSA, the Google Certified Innovator award and the Microsoft Expert in Education award). The interview consists of two parts; one concerns background information and the other concerns educational beliefs about teaching CS.

**First Part:**

- What is your name?
- How old are you?
- What is your academic major and degree? When? Where?
- What grade do you currently teach?
- Where is your school?
- How long have you been teaching?
- What kind of award did you win?
- When had you won the teacher's award?

**Second part:**

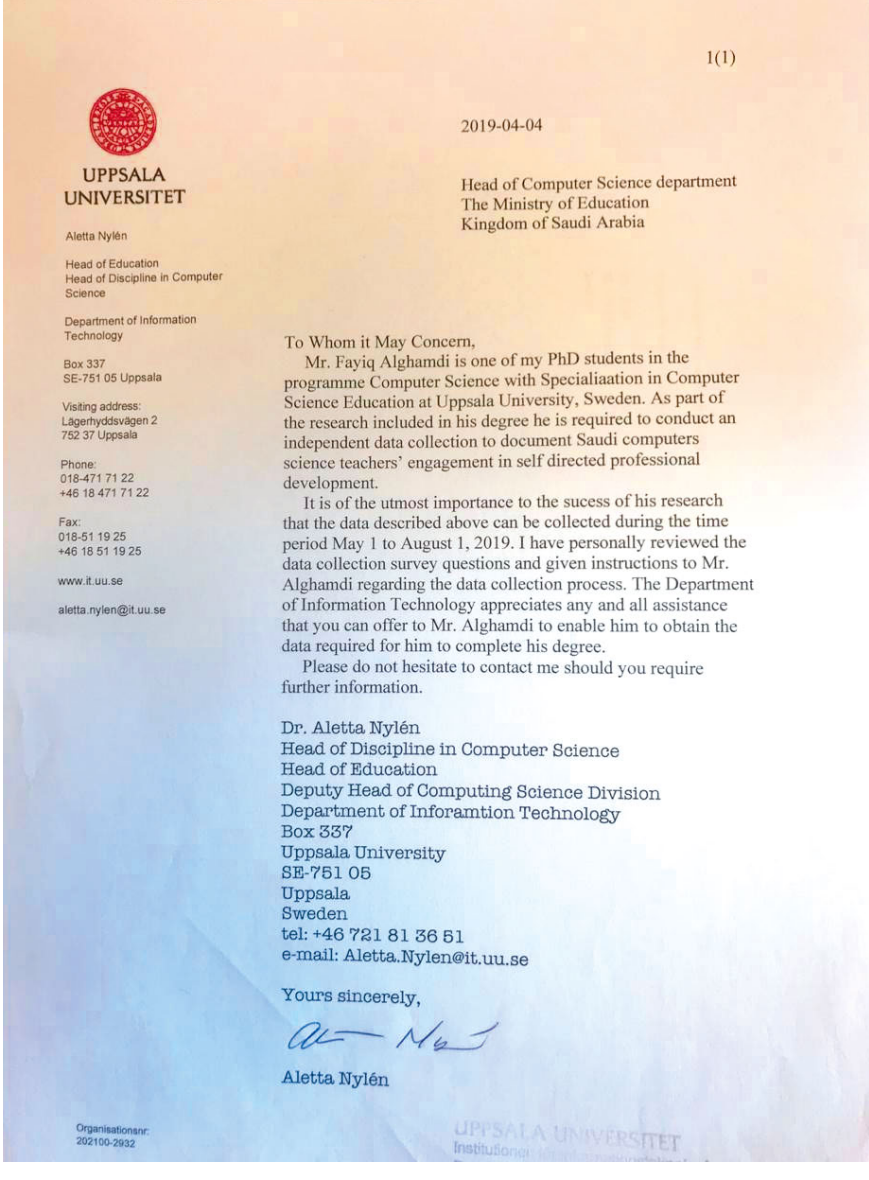
1. Briefly describe how you are teaching CS.
2. Why did you apply for the teacher's award?
3. Do you think receiving this award will influence your teaching? How?
4. Did you change your strategy before you applied?
5. Do you think this award could change a teacher's practice? How?
6. How long time did you spend preparing?
7. Only 4% of the teacher population has participated. How could the award be more attractive to teachers?
8. Describe some of your teaching approaches (active learning, student-centric learning, etc.).
9. Do you think the award influences you to change your educational beliefs about teaching CS today? How?

Thank you for the valuable information. Is there anything else you would like to add?

# 15 Appendix No. 2 (Questionnaire)

| | Statement |
|---|---|
| The Learner Self-Directedness in the Workplace Scale (SDL) | 1- I go out of my way to improve my work-related skills. |
| | 2- I motivate myself to learn something new about my work. |
| | 3- I make a special effort to keep up with developments in my job. |
| | 4- I am constantly on the lookout for courses or books about my work. |
| | 5- I often read to improve my work-related knowledge and skills. |
| | 6- I frequently investigate opportunities to learn more about my work. |
| | 7- It is exciting to learn new things that widen my work-related skills. |
| | 8- I enjoy reading about different aspects of my work. |
| | 9- I am keen to develop my work-related knowledge and skills. |
| | 10- I get excited when I learn new skills. |
| | 11- I enjoy learning new things that contribute to my work performance. |
| | 12- I often choose to learn new things about work even if it does not form part of formal learning situations. |
| | 13- I constantly try to keep up with developments in my field of work. |
| Reason | 14- I used SDL to develop my knowledge in the field of teaching and learning theories |
| | 15- I engage in SDL as one way to fulfilment the requirement in PD. |
| | 16- A reason for a teacher practice the SDL is following students need at schools |
| | 17- A reason for a teacher practice the SDL is following s teacher's personal plan in PD |
| | 18- A reason for a teacher practice the SDL is the lack of other ways (training program, master program, Kabaret, etc) |
| | 19- A reason for a teacher practice SDL is following the STCS |
| | 20- A reason for a teacher practice SDL is preparing to apply on Teacher's award |
| planning | 21- I used SDL to develop my professional skills in assessment students |
| | 22- I used SDL to develop my professional skills in using technology |
| | 23- I take part in SDL to develop my knowledge in CS. |
| | 24- I take part in SDL to develop my knowledge in CS teaching. |
| | 25- I used SDL to develop my professional skills in classroom management |
| | 26- I used SDL to develop my professional skills in planning the lessons |
| | 27- I used SDL to develop my professional skills in effective classroom communication |
| | 28- I usually trying out new teaching methods in my class |
| Professional Development | 29- The National Center for Vocational Education Development, NCVED motivate me to adopt SDL. |
| | 30- I sometimes participate in a pedagogy program (conference, workshop, e-training and teachers' meeting) |
| | 31- I sometimes use teacher's book to give me the necessary knowledge that I need in CS teaching. |
| | 32- I develop my teaching practices through reading books |
| | 33- I develop my teaching practices through education sites on internet |
| | 34- I develop my teaching practices by discussing with colleague |
| Self-reflected | 35- I need to learn how I manage SDL professionally |
| | 36- I sometimes do critical reflection on my teaching experiences |
| | 37- I take supervisor's feedback into my account when I plan to develop my practices. |
| | 38- I take students' feedback into my account when I plan to develop my practices |
| | 39- I take principal' feedback into my account when I plan to develop my practices |
| | 40- I take colleague' feedback into my account when I plan to develop my practices |
| | 41- I take parents' feedback into my account when I plan to develop my practices |
| | 42- I used other materials (worksheet, presentation, etc) in my lessons. |

# 15.1 Appendix No. 3



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2019-04-04

Head of Computer Science department
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To Whom it May Concern,

Mr. Fayiq Alghamdi is one of my PhD students in the programme Computer Science with Specialiaation in Computer Science Education at Uppsala University, Sweden. As part of the research included in his degree he is required to conduct an independent data collection to document Saudi computers science teachers' engagement in self directed professional development.

It is of the utmost importance to the sucess of his research that the data described above can be collected during the time period May 1 to August 1, 2019. I have personally reviewed the data collection survey questions and given instructions to Mr. Alghamdi regarding the data collection process. The Department of Information Technology appreciates any and all assistance that you can offer to Mr. Alghamdi to enable him to obtain the data required for him to complete his degree.

Please do not hesitate to contact me should you require further information.

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Yours sincerely,

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