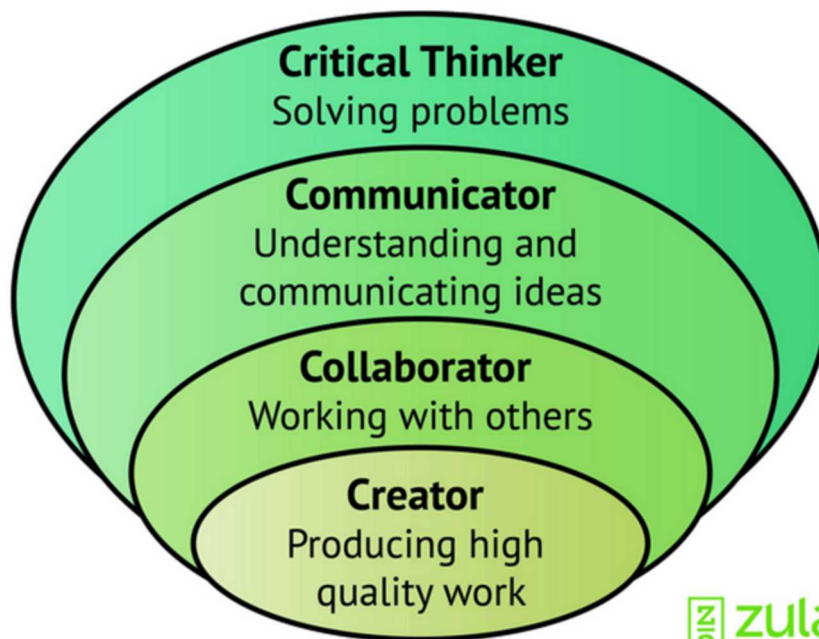


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# Leaving Home? Global Education Strategies

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## Abstract

College in much of the West is the formal site of higher education but what is expected from college is education more broadly conceived. The university is a place where students come to learn but it also is a collection of spaces where informal learning builds their capacities to create and perform on a larger stage than family and neighborhood. The public sphere constituted by the university is sheltered, but students are still exposed to individuals from different backgrounds and encouraged to expand their horizons to embrace concerns that lie outside the interests and competence of their families and neighborhoods. The adults and peers who surround them make demands that each student must either accommodate or resist. How to make these choices is an important element of both “global education” and the transition to adulthood. Some of this informal learning is accomplished through leaving home to join a university community. Here I examine the structures and practices that influence informal student learning where the relative impact of the home and the university differ. I also look at three study-abroad programs, arguing that the spaces and places of education in a foreign country remain influenced by the cultural values of home and home institutions. My purpose is to evaluate the extent to which these universities and programs prepare graduates for life in a globalized world, and to determine some of the reasons lying behind the differences.

## Keywords

Global Education, Informal Learning, Study Abroad, Space and Place, Protected Spaces, Resilience, Diversity

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## 1. Introduction

College in much of the West may be the formal site of higher education but what is expected from a college is education broadly conceived. The university is a place where students come to learn but it also is a collection of variously protected spaces (Tétreault, 1993) within which they can discover their capacities to create and perform on a larger stage than family and neighborhood. They enter as adolescents, bursting with potential; they

depart three or four years later, as young adults. If their time has been well-spent, they leave with the tools and nascent networks they need to embark on their life journeys. Many of the tools are skills transferred explicitly as part of their “education” such as the ability to write clearly, do mathematics, master a foreign language, organize and conduct investigations, speak before an audience, use technology, perform as artists. Other tools also are skills but are learned by experience rather than taught explicitly in the classroom. Examples are how to adapt to unexpected circumstances, how to choose friends and allies, how to identify and solve problems, when to abandon what “everybody knows” for knowledge that contradicts accepted wisdom, how to identify, build, and flourish in communities—the several networks that will sustain them professionally and personally throughout their lives (Fischer, 2013; Sotomayor, 2013).

The university is a part of the public sphere, but it is not fully public. There are standards for admission and retention that result in a substantially self-selected population with many shared interests, expectations, and goals. Even so, students are exposed to individuals they have never met before, some from different cultural backgrounds, varied life experiences, and different world views. Neither the adults nor the peers who surround them are responsible for them or as interested in what they do as their families and friends are. At the same time, these individuals make demands that each student must adjust to whether or not s/he decides to accommodate or resist those demands. How to make these choices and act on them are key elements of the transition to adulthood, and necessary skills for success in professional life.

For most US students, much of this informal learning is accomplished through living in the university community. Leaving home for college is a rite of passage, a transition from childhood to a more independent style of life. The familiar world of parents, siblings, and childhood friends is left behind. Students are responsible for organizing their own time, space, and activities. They try out new ideas, new techniques, new looks. Even though they may be able to go home for holidays and perhaps an occasional weekend, in between home visits they have to make places for themselves: organize their own physical and emotional sustenance and fight their own battles. They must deal with the people they disagree with respectfully, as though they were rational creatures just like themselves. In a fundamental sense, failures in adjusting to these tasks are as or more critical to growth and development than successes, especially if failure happens early, while students can see or be helped to see their mistakes, and modify their behavior so that they can avoid similar errors in the future.

Among the two most important of these informal lessons are skills in networking, and an ability to adjust to change. A student who develops relationships with new colleagues adds to her/his potential professional “contacts” and acquires a handful of adult friends who, ideally, last well beyond graduation. Contacts share interests and common experiences. Their familiarity is based on encounters that reveal each other’s skills, competence, and reliability. Close friends bond by sharing common experiences beyond the university. These relationships of choice expand and deepen over time. Shared interests develop into respect and affection which, in turn, enlarge the friends’ common experiences and life spaces. Robert Frost wrote that “home is where, when you have to go there, they have to take you in” (Frost, 1914). Close friends expand each other’s home spaces and thereby the strength and security of each other’s lives.

Resilience is the capacity to understand and operate in novel situations. Learning to adjust to new settings and new people in a university’s semi-protected environment allows room for mistakes where errors rarely are fatal. Ideally, failure is a place to start again with clearer ideas about what eventual success requires. The resilient student learns how to evaluate people and situations beyond prior experience, and to look for opportunities in novelty rather than seeing it as an obstacle. Resilient individuals also are able to refine their capacity to recognize different measures of achievement and success, thereby enlarging their own action repertoires.

In this paper, I argue that informal elements of higher education are products of the spaces and places where they occur: the home and the university. I look at three cases to compare their students’ experiences of space and place: the American University of Kuwait (AUK), where there are no boarding students; Trinity University in San Antonio, Texas, which, like AUK also is a private liberal arts institution but one where most students live on-campus; and Old Dominion University (ODU), a large public university located in Norfolk, Virginia, where most students commute to school as AUK students do. Both US universities draw a significant proportion of their student bodies from the local area (i.e., Texas or Virginia) just as AUK does.

US colleges and universities devote some effort to providing opportunities for students to engage in informal learning but much of it is accomplished simply by experiencing the campus as a defined place away from home. Trinity, for example, requires all students to live on campus during their first three years no matter where their families reside. The educational space at all three institutions is enlarged through field trips and community



projects that offer glimpses into unfamiliar work and living environments. Internships introduce students to the demands of the workplace, and sometimes serve as stepping-stones to full-time positions after graduation.

Commuter and residential institutions both feature study-abroad programs. Kuwaiti students who study abroad usually go for more than a year, not only to see the world but also for professional training and to acquire foreign-language proficiency. One concern is that students who receive a large proportion of their higher education abroad may become alienated from their home cultures (Ericksen, 2013; Hausheer & Toops, 2012). US students, who generally spend only a semester or a full year at a foreign university, study abroad for related reasons. Limiting the amount of time they can study abroad is a means to keep them connected to the home university community (Ericksen, 2013). Another strategy for maintaining connections to home is to send students abroad as a group, along with home-country faculty, in so-called island programs (see below).

Along with mastering their subjects, study-abroad students encounter individuals whose politics, business models, or social practices can be very different from their own. In adapting to situations where their basic assumptions are not always shared and may be sharply challenged, they acquire critical distance from their home countries (Zylstra, 2013). In addition to developing human relations and communication skills, they enjoy a space within which to consider and choose from among the unfamiliar aspects of their lives abroad those values, models, and practices that they hope to apply in their own lives when they return (e.g. BBC, 2012; IES, n.d.).

To illustrate some of the contributions of study-abroad to informal learning, I end this essay with a brief look at three programs, two American and one from the Gulf. The US programs are run by the Colorado School of Mines, a highly competitive university located in Golden, Colorado, which specializes in engineering; and Central College in Pella, Iowa, a small, private, religiously affiliated liberal arts college nationally known for its study-abroad program. To Mines and Central, internships and study-abroad are key education strategies explicitly designed to enlarge the personal and professional experiences of members of relatively homogeneous student bodies. I also discuss a preliminary evaluation of the effectiveness of a new Saudi study-abroad initiative, the King ‘Abdullah Scholarship Program (Hausheer & Toops, 2012). This example of a large program that sends students from the Gulf to the United States illustrates some of the limitations of relying on space over place as the primary location for productive indirect learning.

## 2. The Value of Indirect Learning

### 2.1. Diversity and Community

The diversity of a university community contributes to education by providing occasions of direct sharing of ideas, assumptions, and experiences where students can compare anything from family dynamics to religious beliefs, food preferences, or economic and social status with people who are, at the time of sharing, their peers. The simultaneous experience of common and divergent identities and reactions to particular situations and events enables students to evaluate the relative importance of elements such as identity, belief systems, and background as compared to qualities such as dependability, competence, and character. For traditional undergraduates, the university is often the most important place where this transformation takes place.

Community contributes to the moral standing of difference, and thereby to the strategies students develop to understand and work with it. Despite organizational hierarchies of faculty and administration, the university community is horizontal. Significant autonomy rests with individuals who have to earn their places in multiple settings. Although horizontal social aggregates such as departments, majors, and classes share interests, they are composed of people from different families, neighborhoods, religions, social classes, and countries. Students working together in these settings operate on the basis of their commonalities as students in the same course or institution. Difference is thereby normalized. Partners and colleagues are selected for competence, reliability, and congeniality. Similarities across differences also are normalized in that students see others sharing their values and goals—laughing at the same jokes—despite social or class differences.

Networks and friendships are initiated in these horizontal settings. Relationships rest on trust based on performance rather than on identity or affiliation. The social skills that lead to success in university communities are the same ones adults call upon when they are working with counterparts from different countries and cultures (including corporate cultures), where part of their job is to find reliable partners in spite of differences. In novel situations, where customary signals indicating reliability and competence are missing or unintelligible, the resilient adult is one who has learned how to look for signals that operate in those milieux (Godel-Gengenbach, 2013).



## 2.2. Adjusting to Unfamiliar Standards

Strategies for self-preservation and success are acquired from infancy, and help children attract the attention and support they need from families and friends (Hrđy, 2011; Sulloway, 1996). These strategies can be applied in other settings, but resilience depends on being able to adjust or devise new strategies in settings where the underlying assumptions or conditions that gave rise to the original ones no longer operate. Frank Sulloway (1996) argues that individuals from the same family occupy distinct niches that favor particular strategies for success, but these strategies might not be suitable in different places or under different circumstances. Learning to identify and apply a strategy that fits an unfamiliar situation requires experience and practice. Living with strangers, whether as roommates in a dormitory or apartment, or as a foreign student studying abroad, is a source of both.

## 3. Space and Place at Three Universities

Space and place are fluid concepts that overlap conceptually, leading to contestation within and across disciplines. Space is generally viewed as a geographic location, but it also refers to how people perceive those locations and what goes on within them (e.g. Holt-Jensen, 1999). In a somewhat overlapping definition, “place is a portion of geographical space... [s]ometimes defined as ‘territories of meaning’” (Holt-Jensen, 1999: 224). Universities occupy physical spaces within which there are many places, but we also can think of such places as extending into spaces outside the geography of the university. So, for example, AUK and Trinity occupy spaces partly or entirely defined by walls and gates. The spaces are private even though parts of Trinity, including offices and fraternity houses, spill into the surrounding residential neighborhood composed of the private spaces of homeowners. Spaces in the vicinity of a university where students and faculty abound may be thought of taking on some of its character, such as the Trinity or ODU “neighborhood”. Place also spills into spaces beyond the campus that are associated with a university’s identity.

In contrast to AUK and Trinity, ODU does not have an enclosed campus, although many facilities are concentrated along a main thoroughfare. Unbounded, they extend into nearby commercial, residential, and industrial areas, and into other towns and cities. ODU has a geographic center that includes a cluster of colleges, the library, and unique facilities like the orchid conservatory. There is some “residential” housing owned by the university, but most students live at home or in apartments in privately owned buildings. ODU’s extensive space includes branch facilities throughout the Hampton Roads area, and a significant distance-learning component, some of which is aimed at highly mobile military service members. Although the spaces of AUK and Trinity often coincide with specific locations, ODU’s spaces are more consistent with notions of place, such as spaces in public buildings or on military bases that also are used by others.

The importance of space and place as ingredients of higher education lies in how they contribute to the students’ passage to adulthood, particularly the development of autonomy and self-sufficiency enabling individuals to make choices and take responsibility for them, not only in their private lives but also as citizens, workers, and leaders. The content of education provides knowledge and practical skills. The indirect education students receive from the university environment itself is more diffuse.

The common experiences of students create bonds between them that may develop into elements of adult friendship and professional networks. Students develop relationships of trust with peers and professors whom they can call and rely upon even after graduation. They learn to recognize desirable qualities they can spot later in potential supervisors, subordinates—and spouses—who may or may not share the same identifying characteristics as members of their childhood communities. Students build upon and enlarge their criteria for evaluating values and behaviors worthy of emulation—or avoidance. The university as a place allows students to put “good” behaviors into practice because there they have a minimal past life to tether them to things they wish to change about themselves. It is not that university students reject their past, their families, or their friends but rather that they enlarge the pool of individuals and types of models they wish to incorporate in their own lives (BBC, 2012; Sotomayor, 2013). Thus, the university is a place where students can develop a wide range of talents, identify their personal strengths and weaknesses, and try out strategies to win new friends and appeal to people whose cooperation or opposition can affect their future success in life.

### 3.1. Space and Place at AUK

The American University of Kuwait is located in Salmiya, a part of Kuwait where many foreigners live. It occupies the tree-shaded campus of a former kindergarten and is a secure facility with gates and guards able to ob-

serve and regulate who comes in or out. AUK is near the seaside and not too far from a large mall with many restaurants and shops that was quite fashionable when it first opened but has since been superseded by newer, bigger, and fancier shopping centers. On-campus, students can congregate in a restaurant, cafés, in building lobbies which have few places to sit down, and on benches under the eaves of buildings where they can sit in the shade and chat with friends—and smoke. Students generally drive in or are dropped off for classes and many leave when their last class is over. There are a number of student organizations and student groups engaged in projects that meet in empty classrooms or in public rooms. A few offices, like student services, have space with comfortable seating where students can meet although how it can be used is limited by the lack of privacy and the fact that business is conducted there. Overall, however, there are few places on campus where students can congregate comfortably in groups or just hang out with no specific purpose in mind other than socializing.

AUK's self-contained campus suggests its suitability as a place for social interaction and the development of strong community bonds among students and faculty, but limitations on spaces impair its ability to do this. In contrast with private institutions of a similar size in the United States, the model AUK aspires to follow, it is not a home away from home. Envisioned initially as a technical school that would follow an American curriculum in an American-style campus environment, other than by employing foreign faculty and emphasizing English-language skills, it offers little in the way of an American-style "college" experience on a day-to-day basis. Rather, it appears to take an instrumental view of its role as an institution that supplies instruction, and devotes little attention to providing places for students and faculty to socialize. In this sense, it more closely resembles US community colleges than four-year, residential institutions. Another drawback to cross-group networking is that many AUK students are "recruited" by the kin and friendship networks of their families which encourages the formation of cliques and reinforces the relative contribution of family-and-friends to the intellectual and professional socialization of AUK graduates.

The American-ness of AUK is seen by the university administration as centered on its unique-for-Kuwait liberal arts emphasis. Liberal arts incorporates informal learning and is purposely designed to broaden students' exposure to general knowledge as well as the arts. AUK is licensed to offer up to seven degrees in engineering, five in business administration, and five in social sciences and humanities. Then-AUK dean Nizar Hamzeh noted that

A shift toward liberal arts education occurred immediately. As of 2004 (when AUK admitted its first students), liberal arts became the main mission. Emphasis was placed on humanities and social sciences. Business is taught in the context of liberal arts—even engineering. Branching curriculum from 120 credits—45 general education, add 18 credits of free electives—general education and liberal arts—the remaining is less than 60, which goes to the major. In computer engineering we were forced to increase degree requirements to [131] credits... So we became, as of 2004, the main liberal arts institution of Kuwait. It makes AUK distinctive (Hamzeh, 2010).

Yet although the liberal arts emphasis is formally embedded in the curriculum, it is not so much so that students are ensured a broadly oriented education. For example, they can take all their "liberal arts classes" in social sciences and graduate without even one course in history or the arts. In spite of such structural deficiencies (some due to policies of the Ministry of Education—see Tétreault, 2011), AUK strives to provide places where students able and willing to seize the opportunities offered can enrich their university experiences through participation in on-campus projects like fairs, debates, theatrical performances, and public lectures.

There are opportunities for students to travel to foreign countries for a wide range of academic reasons. They attend and make presentations at conventions, and travel in groups to cities in Europe, Asia, and the Americas to see the geography, architecture, art, and economies of places very different from Kuwait. Kuwait is a partner institution of Dartmouth College in New Hampshire, and regularly sends interns for summer work in Hanover, one of several programs that link Dartmouth and AUK. In 2012, five interns worked at Dartmouth in locations as varied as an art museum and a media-production group. One worked in the center for world languages, tutoring Dartmouth students in spoken Arabic. Such internships are especially effective in demonstrating operations—how such places work—in addition to exposing students to a new country and people (Pearson, 2012).

AUK employs Kuwaiti as well as foreign faculty, virtually all of whom received their advanced degrees abroad. There is no tenure system at AUK and little in the way of grievance procedures. Even so, there is some *de facto* stability in the composition of AUK faculty and staff despite the lack of institutional brakes to moderate turnover or protect faculty members from harassment in or outside of the university. The rising number of pri-

vate universities in Kuwait and elsewhere in the region offer employment alternatives, but these alternatives support little more than a system biased against the retention of controversial employees likely to be among the most demanding and provocative teachers. Even so, many AUK professors devote considerable time and energy to working with interested students on projects as varied as anthropologist Marjorie Kelly's "Kuwait at Fifty" video celebrating the country's fiftieth anniversary as an independent nation-state, and Amir Zeid's mentoring of AUK computer science students who have competed in the Microsoft Imagine Cup since 2010. The Imagine Cup provides, in addition to mentoring and individual instruction, another overseas opportunity for winners to travel. After winning in its region, AUK sent teams to compete in world finals in Poland, the United States, and Australia (N.A., 2012a and b).

### 3.2. Space and Place at Trinity

The Trinity campus also is self-contained but much larger than AUK's, with dormitories, gymnasias, a large student center, and buildings with places for informal student interactions, such as a coffee shop in the library and lobbies in several academic buildings with comfortable chairs, tables, and ready access to computer labs, as well as to faculty offices and classrooms. Most campus buildings are constructed from "Trinity brick" whose distinctive size and color confer a visual unity on the campus. The dormitories and dining hall house and feed virtually all freshmen, sophomores, and juniors, along with some seniors; fraternity and sorority houses are where sub-communities thrive; intercollegiate sports attract student participants and fans from across the campus; and outdoor spaces with and without formal seating arrangements are places where students regularly congregate and where classes are sometimes held. One is a fountain! Student activities take place all day long and well into the night. Multiple student organizations with various missions attract members who share religious or ethnic affiliations, political interests, academic ambitions, and/or social goals. Many have faculty or staff sponsors; the character of any group depends on the particular persons, concerns, and events shaping its work at a given time.

The Trinity faculty has a stable core. Most professors hold tenured or tenure-track positions, and the university makes an effort to retain committed faculty. Together with tenure, the result is that talented and dedicated people offer introductory or signature courses that link generations of students over the faculty member's professional lifetime. An extensive and detailed common curriculum ensures both that students sample a broad range of disciplines, and that they regularly encounter peers with different talents and interests in their classrooms. These encounters reinforce the diversity in living situations that fosters friendships across multiple lines. Every summer, the incoming freshman class reads a book chosen by a faculty committee. It highlights a central theme discussed at one or more events at the beginning of the academic year. Often the author of the book is invited to campus to provide a lecture for the community and a topic of common conversation campus-wide. Professors help students organize class-related on-campus events and sometimes host students at their homes. The integration of faculty and students contributes to the cohesion of the university community and the sense of identity that it generates.

The space and places that constitute "Trinity" in the minds of students, faculty, and administration are so distinctive that its denizens refer to it as the "Trinity bubble". The bubble also comes in for criticism: it insulates students from the problems of urban San Antonio; it doesn't prepare students for the hardships they are likely to encounter in the new economy; and it sometimes takes the "*in loco parentis*" quality of university life too far. Yet it is appreciated as the signifier of a corporate identity with a proud history and a place in the larger world of the city, the state and, increasingly, of Washington. Faculty members encourage community and sub-community formation and call upon former students to help new graduates get introductions, internships, and jobs. Trinity spaces extend to an ambitious and successful study-abroad program. Rather than limiting possible destinations by establishing overseas centers, Trinity sends its students across the world to a wide range of spaces and places. Perhaps the greatest limitation on where Trinity students can study abroad comes from family members who themselves have not traveled and are apprehensive about their students' safety. When students return, they participate in classes and events that build on their study-abroad experiences, such as photography competitions and seminars.

### 3.3. Space and Place at ODU

ODU, a university that confers a number of graduate as well as undergraduate degrees, occupies a number of spaces between AUK and Trinity as an undergraduate institution. Like AUK, ODU is located near the sea.

Home of the US Atlantic Fleet, Norfolk has a long history as a major Atlantic port. A remnant of that history intersects with the university. Quarantine Road, part of which remains as a barely visible stone path behind the student center, was the location of the first Quarantine House in Virginia. It was established in the mid-eighteenth century so that ill persons carried by ship to the port could be isolated and cared for in a contained area to prevent contagion. Unlike AUK, where the previous identity of its space is well-known if rarely celebrated, or Trinity, where the terrain of its current space (it has occupied three locations since it was founded in 1869) is integral to campus ceremonies and events, few ODU students are even aware of Quarantine Road. That the university overlooks the largest coal port in the eastern United States is also uncelebrated, but its coastal location is one of its prime attractions and supports excellent programs in oceanography.

ODU's collective identity is organized around athletics. As with other large state universities, ODU athletic events bring faculty, students, and members of the larger community together to root for prize-winning men's and women's basketball teams and, more recently, a new football team. But the foundation of identity for most ODU students lies in programs, departments, and classes taken in their majors.

Unlike AUK and most courses at Trinity, introductory classes at ODU tend to be large, with the main interaction between students and instructors mediated by teaching assistants. Course distribution requirements rarely provide the same quality of common experiences for students that such courses do at AUK and Trinity, both because they rarely involve common enterprises such as group projects, trips, or university events, and because they often are "placeless" even if they are held in the same space. At ODU, majors and professional programs linked to departments and professors form the basis of the collective experiences of graduates. The bonds in these groups can be very strong whether graduates remain in the vicinity or relocate elsewhere. Yet while the ethnic, religious, class, nationality, and other dimensions of diversity of the ODU student body are far broader than at AUK or Trinity, the intellectual experiences and friendships of ODU students tend to be narrower, centered on majors or, as at AUK, upon networks initiated and sustained in the surrounding community rather than in the university as such. For example, in a course on women and the military, students bonded more closely with one another if they shared a military or a civilian identity rather than a common major or even a shared identity as women or men. Distance learning and the number of part-time and returning students also take away from the common experience of some ODU students although others manage to sustain university-initiated and nourished friendships that transcend the communities of origin of their members.

Limits to socialization and informal learning at ODU arise less from spatial or place constraints than because so many students do not spend much time in the university spaces or places that do exist. Students with full-time jobs, returning students with families, students in military families that are themselves transient come for classes and to use the library and laboratories, but spend most of their lives elsewhere. In addition to the family-and-friends demands that AUK students juggle, many ODU students have one or more identities that take priority over their identities as students. They have little time to spend on informal learning with peers and little time to be instructors of their peers. This is one reason why the classroom is such an important space with regard to acquiring friends, networks and resilience, and also why its influence is limited. The adult students already have experienced the rites of passage traditional undergraduates undergo at college. Even from the perspective of the university, most such graduates are not "products" of a unique environment provided by the institution. ODU also sponsors study-abroad programs, but they are less salient and celebrated on the campus than the trips abroad taken by AUK students or the study-abroad program at Trinity. Like other aspects of ODU, they occupy relatively small places in the university space.

#### 4. Space, Place, and Learning in Foreign Settings: Study Abroad

Preparing students for professional lives in a globalized world is one reason for encouraging them to study abroad. Businesses and several sectors of public service value the language skills students can acquire abroad and also the demonstration of their ability to adjust to environments and situations that are unfamiliar that an extensive period abroad implies. Employers seek job candidates who can "hit the ground running". To them, study-abroad experience demonstrates both a willingness to venture into alien climes and evidence that the candidate has been able to function successfully there, especially if internships or other experiential learning is part of the package (Redden, 2010; Trooboff et al., 2007-2008).

Study abroad models vary but most range between two ideal types. One houses students from the same university together in the host country. Some classes are taught in the residence house by local faculty and others

are taken at different institutions across the city. The “purest” version of such “island programs” brings home-country faculty to the host country to offer courses specifically designed for that group of students. To island programs, the foreign location is a space, but the place of formal education remains the home institution (Norris & Dwyer, 2005). Students visit local historical sites and museums and avail themselves of other cultural opportunities, but their formal education takes place in a bubble where the main concern is that their classes satisfy graduation requirements at their home institution.

The other end of the continuum is direct enrollment, also called full-immersion programs. Students apply for admission directly to the host institution and take courses there, living among local students, and relying on the foreign university’s support services. Trinity’s study abroad program is mostly direct enrollment, which offers students the entire world (of academically approved programs in countries the US State Department certifies as safe), some including internships, to choose from. Trinity also offers a handful of island programs, shorter trips under faculty supervision that are similar to the study-abroad trips at AUK. Under direct enrollment, it is rare for more than one student to attend the same institution in the same semester or year. Most study abroad programs such as those at Mines and Central are hybrids that occupy different places on the continuum between these two ideal types.

#### 4.1. Study Abroad at and from the Colorado School of Mines

Study abroad at Mines works in both directions, with students from Mines studying abroad and foreign students studying at Mines. Among the goals of the Mines study abroad program is for students to see how things are done abroad, to make contacts with peers and professionals in countries where they might later work, and to be able to hold internships in the industries they are preparing to enter as professionals after graduation (Godel-Gengenbach, 2013). But like other universities, Mines encourages study abroad for a range of reasons. Students who are highly focused on technical subjects, and/or come from the western United States with little or no experience in foreign countries or even in other regions of the United States, find that study abroad literally opens new worlds. In at least one case, it provided an opportunity for a student who struggled academically. He had limped through his first three years with mediocre grades, and was advised to take his last year abroad. He chose to study in Spain. There he was able to capitalize on his foundation in Spanish, fitting smoothly into his new environment, earning respect for his rapidly improving language skills, and discovering pools of additional expertise he could share with his peers. Now he runs a construction company in the United States, keeps in touch with friends he made in Spain, and is an enthusiastic booster of study abroad.

Foreign students come to Mines for varying periods of time and have to be competent in English before they matriculate. Even so, some find themselves at an academic disadvantage with respect to their American peers. “Americans know the system; they understand that homework and attending class are important. Foreign students need to learn how to participate in those activities” (Godel-Gengenbach, 2013). Examinations are conducted differently and some students do not know how to prepare for them. Students who were successful during their first two or three years at university at home don’t always know how to access tutorials that bring students together with a more senior teaching assistant. “Degree-seeking students from their own countries are often too busy to provide adequate assistance, and the ones who need help don’t like to ask” (Godel-Gengenbach, 2013).

Foreign students find places to make friends in club sports, a major preoccupation at Mines where talented foreign athletes are sought after and recruited by their American classmates. Foreign students also meet peers at the mosque, in each country’s student organization, and in Phi Beta Delta, an international honor society. Students from the Gulf usually have to get used to coeducation which, inasmuch it exists at all at home, could in practice mean that male and female students are separated by a wall down the center of the classroom. Despite a popular on-going design program with Abu Dhabi, it took five years for Emirati women to be sent to Mines. On the other hand, Saudi women have studied at Mines for some time. They tend to do as well academically as their male compatriots and many find employment with the national oil company, Saudi Aramco, after graduation.

Mines hopes to increase the proportion of US students studying abroad, now about 27 percent of undergraduates. It has links with universities around the world, including in the Gulf. The Petroleum Institute (PI) in Abu Dhabi began as a joint venture with the UAE and Mines. Now, under the direction of the Emiratis, the PI has become an exchange program destination for Mines students and interns. Among the Emiratis who come to Mines are graduate students and professionals enrolled in continuing education programs. In 2012 three Mines



students participated in the exchange program at the PI. As the first exchange students at the PI, they learned about the region, took courses consistent with their degree plans, and one even obtained a summer internship with ADNOC, the national oil company. Yet one American student was turned down by the PI because he came from an Afghan background, even though he was a US citizen. Some Mines students spend a semester at Montanuniversität Leoben (one of Mines's first partners), and others study foreign languages in France, Spain, and Germany.

## 4.2. Study Abroad at Central

Study abroad at and from Mines is directed toward professional preparation. It reflects the university's mission, and incorporates aspects of direct enrollment and modified versions of island programs at selected foreign institutions such as the PI. At Central College in Pella, Iowa, the study abroad program, started in 1965, is designed to enlarge the life experiences of a small population of students, most of whom come from Iowa or nearby states, by giving them the chance to study and live abroad. About half of Central students study abroad for a semester or more at one of six locations in Europe and one in Latin America. Central's program is a hybrid that comes closer to the island end of the spectrum. Students study and take some classes together and also take courses at a local university. Some US students come from other US schools, and the program centers make an effort to incorporate foreign students from the local area in their activities. A few students study in other programs that more closely resemble direct enrollment. In 2013, two were in Oman and one was in China (Zylstra, 2013).

"The study abroad experience for most is the first time they have been far away from home for a significant amount of time." The "leaving home" experience is a primary element in the intense bonding that students undergo when they are abroad. "I am mid-career now but we are still connected. When we run into one another it's 'do you remember?'" (Zylstra, 2013). Among the goals of Central's program is to give students the opportunity to improve their skills in the local language; to learn about the local culture; to experience personal development—"study abroad is a perfect environment for personal growth... encouraging students to become adaptable, to 'work in the grey'" (Zylstra, 2013).

Professional experience is not a focus of Central's program although it does influence the careers of some students. "For education majors, it affects how they behave as teachers. They have a global perspective. [Program alumni] see it as changing their approach." Central business majors choose to study abroad "because of the internship programs, and because they understand that business is international, and realize the importance of having international experience" (Zylstra, 2013). Although the explicit aims of study abroad differ between these two institutions, it is clear that the experiences of students in both programs are similar. Study abroad as such offers unique places for indirect learning in spaces all over the world.

## 4.3. "US Most Preferred Destination for Saudi Students"

The King 'Abdullah scholarship program (KASP) offers two different pools of Saudi youth the opportunity to study in a wide range of degree programs abroad. The scholarship pays tuition and travel, medical expenses, and a monthly salary to a small number of elite applicants residing in Saudi Arabia, and any Saudi nationals currently living abroad (*Handbook for Saudi Scholarship Students*, 2009, cited in Hausheer & Toops, 2012). Consequently, this program is both a small, highly selective scholarship opportunity available only to a small pool of elite applicants in Saudi Arabia and an all-welcoming program to Saudi nationals already residing in the United States (Hausheer & Toops, 2012). Of the nearly 150,000 students world-wide receiving KASP grants, more than 69,000 are currently studying in the United States (US Most Preferred, 2013).

Study abroad is one of the ways that Saudi Arabia copes with the upsurge of demand for higher education that characterizes most Gulf Cooperation Council (GCC) states. Unlike Kuwait, Saudi Arabia also is investing in expanding colleges and universities at home (D'Andrea, 2009; Davidson & Smith, ed., 2008; Hausheer & Toops, 2012). Officially, the purpose of KASP resembles the goals of US-based study-abroad programs: to foster cultural exchange and to provide students with a broad range of opportunities to advance their educations. Other purposes deduced in a recent study of the KASP program in the United States include strengthening the patronage networks that shore up the regime, diffusing potential unrest among Saudi youth, and demonstrating a commitment to reforming education for women who make up more than 23 percent of KASP students (Hausheer & Toops, 2012; US Most Preferred, 2013).

The importance of training students for future employment explains why the Saudi government promotes

study in the so-called STEM fields: science, technology, engineering, and mathematics. It hopes that students will return to work in government and private-sector positions which operate under “Saudization” mandates requiring the gradual replacement of foreign with domestic employees. During the first round of the KASP program in the United States, the Saudi Arabian Cultural Mission (SACM) selected both the school and the major for each recipient. Now, according to one student in the program, “nearly any major is permitted by SACM — even those not on the ‘approved’ list” (Hausheer & Toops, 2012: 39), which include in addition to STEM fields, medicine, accounting, law, and those preparing graduates for work in the tourism industry. An education analyst interviewed by Stefanie Hausheer and Gwendolyn Toops (2012: 39-40) said that the growing leniency was a response to the students’ preference for study in the United States, both for practical reasons (cost of living) and because that is where they want to live. They appreciate their new-found independence, the freedom they enjoy, and the chance to go to concerts, films, and other public events. They like meeting different kinds of people (“mixing with all races... [learning] respect for other opinions... and other religions” [Hausheer & Toops, 2012: 60]) and the women like being out from under the Saudi law that forbids them to drive (Wagner, 2011).

Majors are spreading into different fields, however, and the vastly different backgrounds from which students are drawn also contribute to rising heterogeneity in the program. Most of the KASP students studying in the United States do not come through the highly competitive national selection process. They are self-selected—i.e., they must fulfill the same citizenship, age, and employment criteria and, if they are women, live with a male guardian during their time abroad—but otherwise they can simply apply for a scholarship if they are accepted in an English as a Second Language (ESL) program and travel to that US institution and request support from SACM (Hausheer & Toops, 2012: 36-38). Although most believe that a US degree is better than a Saudi degree in the same field (Hausheer & Toops, 2012: 56), many realize that it is likely to be difficult to get jobs when they return home, especially women to whom most jobs are closed, while family and legal constraints make working outside the home logistically and social daunting (Hausheer & Toops, 2012: 56-58; Wagner, 2011).

Most observers see KASP as expanding the world views, networks, and resilience of students but also note that their experiences are limited by the objectives of their government and society (e.g. Hausheer & Toops, 2012; Wagner, 2011). This makes much of the study abroad experience one of space rather than place. Study-abroad students from any country may isolate themselves by spending more time with peers from their home countries and regions than they do with locals, or by immersing themselves in social media rather than building social relationships in the host country (Huesca, 2013). Just as limiting are the attitudes and shortcomings of the receiving institutions and communities.

Anecdotal evidence and conversations with Saudis participating in the [KASP] program indicate that Saudi students are often ghettoized during their time in the United States. It is easier for them to live with and befriend people who speak Arabic, and to form friendships with other Saudis. Many live with siblings, making it even more difficult for them to immerse themselves fully in American culture. Recent conversations confirm that many Saudis want to socialize with Americans but are shy or do not know how to engage with them. Women face particular challenges in this regard... [T]he sensible response would be to... develop initiatives and programs to more effectively connect these Saudi students to Americans. This would involve not only university communities, but local service organizations, schools, nongovernmental organizations, and businesses. Perhaps one component of these initiatives should be connecting Saudi students to American host families. Living with a host family would encourage Saudis to practice their English while at the same time immersing them in American culture. Ideally, this experience would forge lasting friendships and enhance cultural awareness between Saudi students and their host family. Such exchanges, though not without challenges, would also help alleviate American misconceptions about Saudi Arabia (Lebaron & Hausheer, 2013).

This assessment reflects an appreciation of the benefits of study-abroad outcomes desired by sending countries for the receiving society as well. Greater integration of study-abroad students in host-country communities can generate places for participants within and beyond the spaces of nations. Programs that feature home stays, like many Trinity study-abroad locations, embody the precise conditions outlined above.

## 5. Conclusions

Cities are imagined as cosmopolitan spaces in which novelty, diversity, and congenial places for human interac-



tion enrich the lives of their inhabitants. Universities share some of these qualities whether they are located in urban environments or not. Often they are the first such cosmopolitan spaces encountered by undergraduates. The university space allows students gradually to distinguish between the concrete notion of space as location and metaphorical, more complex, notions of space and place as networks and communities where human action takes place (Arendt, 1959). The development of Arendtian “spaces of appearance” is limited by the extent of students’ encounters with difference, and how little or much they can or must adjust to it. The three universities discussed in this essay represent different understandings of space and place. All three feature programs that enlarge the space and the number of places of formal and informal learning where students can begin to develop social and professional networks and thereby the autonomy and resilience that underpin adult success. Some of these programs are campus-based but others include ventures as close as internships in a local industry and as distant as study abroad on another continent.

Each setting supports a different relationship between student and university. AUK and ODU are not exclusive life spaces as Trinity is for its students during their first three years. Whether enclosed, such as the AUK campus, or spread across a wide geographic area, like ODU, these two institutions are places to learn and make friends for students whose lives are rooted in the homes, families-and-friends, and jobs outside where they spend at least as much of their time. They have opportunities to bond to fellow students but the university community is rarely the primary source of identity for such student inhabitants. In contrast, Trinity takes the place of home and family at the center of student identity to the extent that its denizens see their community as a bubble from which they experience everything else as outside. Dormitory living, small classes, shared experiences, and the conscious development of common values and goals encourage bonding among a diverse collection of students and faculty that lead to life-long relationships centered on the Trinity experience. To let in more people and a wider range of experiences, Trinity, like Mines and Central, also emphasizes experiential and informal learning off-campus, in study-abroad programs, internships, and community outreach. Such programs extend the spaces of these universities and incorporate the places they occur into the student experience. Even so, Trinity prefers that such experiences not interfere with the bond between the student and Trinity. Unlike Mines, Trinity discourages study abroad during a student’s senior year (Ericksen, 2013). The study-abroad program at Central also regards student-college bonding as a priority of its modified island program.

Among the goals of creating off-campus spaces and places of learning is to enable students to acquire measurable skills, like language proficiency and job experience, that add to their desirability as new hires after graduation. In addition, students are assumed to have acquired the capacity to adjust to new situations and thrive in novel environments, characteristics that give their holders an advantage in a globalizing world. Yet the mere fact of studying abroad or holding an internship is not a guarantee of these capacities. Even the ESL programs taken by Saudi exchange students do not guarantee the same level and ease in conversation and reading that an extended home stay is likely to provide. Similarly, although trips abroad enrich the education of AUK students, they do not provide the same experience as “leaving home” and having to manage in another world. While every study-abroad program brings benefits to students, those that not simply enable but actually require participants to engage locally—to break the bubble of the home identity in order to learn to operate successfully in the host country—are the ones that deliver the most benefit to the individual and the employer. In sum, indirect learning is as important as programs and courses in preparing students for adult life. Like the formal attributes of these spaces of education, the informal places also should be investigated before students make choices likely to determine the trajectory of the rest of their lives.

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# Teamwork at University in Spain: The Importance of Foreign Students

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## Abstract

**This study discusses the experience of the implementation of a peer-norm in reducing free riding and conflict problems in teamwork activities. This exploratory experiment is run with two cohorts of students in one of the principal Spanish universities. The educational problem is to control for student potential collusion (with clear free riding episodes) in homework projects performed by assigned groups. The peer-norm intends to control for it. The empirical analysis identifies that the success of this norm is associated with the presence of foreign students. Empirically, the presence of foreign students in each cohort brings an educational and cultural background different from the natives' one. Their presence in work groups turns out to be the key factor to reduce potentially the degree of collusion in the overall cohort because they seem to be less concerned by the "social retaliation" of the mates.**

## Keywords

**Student Behavior, Peer-Norm, Probit Estimation**

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## 1. Introduction

This contribution aims at presenting novel evidence about the creation of an *ad-hoc* peer norm that is expected to limit the free-riding problem in group activity. This evidence refers to a specific case study: the implementation of a new education program in European countries.

The new European Superior Education Space (ESES) program entails important changes in the structure and organization of teaching activity at university level. This education reform applies to European Union countries and it assigns great importance to activities students complete out of the class time. Those activities aim to develop several transversal skills and favor cooperative work. However, the implementation of several group activities outside of the regular teaching hours often gives rise to problems associated with the effectiveness of the

organization of their tasks and the need to define a device for identifying the individual's contribution to the running of joint projects.

In addition, it has often been pointed out that teamwork may suffer from situations of internal conflicts between group members in the completion of the assigned tasks which affect their accomplishment. The most frequent complaint of the members of the group is indeed about the free-riding problem that is usually reported to the lecturer by the group members individually or in smaller sub-groups (del Canto et al., 2009).

The ESES reform in higher education means that academics face a clear problem of implementing an effective scheme for grading teamwork activities. In order to achieve this scope, it appears to be appropriate to implement incentive devices yielding a typical separating equilibrium (under the viewpoint of the incomplete information theory) for individual evaluations. Economic theory suggests that these are cases in which the engagement of individuals to achieve a target (namely, to complete the teamwork activity) is a truly effective way to overcome the problem of free-riding (Hamilton et al., 2003; Macho-Stadler & Pérez-Castrillo, 2001). It has also been proven that peer pressure and other factors such as norms, mutual monitoring and empathy to interact, provide the right incentives for getting rid of the free-rider problem and avoiding the pooling equilibrium situation for individual evaluation (Kandel & Lazear, 1992).

This study deals with the empirical analysis of one of the out-of-class experience encouraged by the ESES reform<sup>1</sup>. In line with the established theoretical framework, and in order to control for the aforementioned free-rider problems for the selected out-of class activity, I implemented a specific norm to be applied by all the students enrolled in my class. This norm has been built on the spirit of being able to eliminate conflicts among group members, identify individual participation to the teamwork (and then grading each student appropriately) and limit free-riding or collusive behavior. The aim of the norm is to provide suitable pressure among peers (through mutual monitoring), thereby making them derive the highest utility in revealing private information rather than keeping it as a secret. In practical terms, this translated into the action to declare, quantify and jointly subscribe to each individual's participation and contribution to the teamwork. This produces a situation in which students may effectively differentiate their individual participation in the teamwork (and then, in practice, achieving an expected separated equilibrium). Hansen et al. (2006) have already adopted something similar to study the determinants of productivity performance in a college classroom achieving good results.

Once implemented, this norm allowed a pilot experiment to run in order to collect quantitative information on the individual participation to the teamwork project for two different cohorts of students.

The empirical analysis of these data is informative. In addition to reducing the rate of conflicts,<sup>2</sup> the implemented norm has enabled the identification of the factors which endorse the students' ability to achieve a stable equilibrium, in which they admit their true contribution to the teamwork. The econometric analysis identifies that the presence of foreign students (mainly Erasmus students)<sup>3</sup> is the key factor that reduces students' incentives to either cheating or free-riding. In this respect, the adoption of the peer norm allowed achieving the established goal and, hence, a few conclusions about the importance of the heterogeneous composition of the class are put forward as an effective device to reach that goal.

The rest of the paper is organized as follow: Section 2 discusses the organization of the experiment while Sections 3 and 4 analyze and discuss the empirical results. Finally, Section 5 provides conclusions.

## 2. Conflict Resolution: The Established Norm and the Experience

This experiment has been led at the Universitat Autònoma de Barcelona (henceforth, UAB). It has been run in one of the elective courses (External trade) operating as part of the undergraduate business training. This course is quite popular among local students, but also among students coming in from foreign universities mostly under the framework of the Erasmus program.

The experience has been conducted using the two cohorts of students for academic years 2012-2013 and 2013-2014.

<sup>1</sup>I am aware that data exploited in this contribution refer to a particular case study. Therefore, I believe that this study delivers interesting exploratory results encourage the further extension of this research line in a properly planned field experiment.

<sup>2</sup>It refers to the conflicts reported to the lecturer as discussed in del Canto et al. (2009). The norm was effective because since its implementation I stopped receiving complains about the involvement of individuals in the making of the group report.

<sup>3</sup>The Erasmus (*European Community Action Scheme for the Mobility of University Students*) programme is a student exchange programme that has been established since 1987 inside the European Union member states. In order to be eligible to participate to this programme, a candidate must be coursing at university degree or diploma and having completed the first year course.

I have been teaching this course since 2009. In the academic year 2012-2013, the ESES reforms required to organize new forms of evaluation of students (beyond the final exam), generally promoting the implementation of team working. My first concern has been establishing a norm to control the organization of the teamwork, to limit the potential conflict among students and, at the same time, to be effective for grading them individually.

The organization of the teamwork activity follows two main criteria. First, the group activity is a compulsory requirement for all students to pass the course. Second, students are completely free to form their groups and the group size must be between two and six persons, even if my personal suggestion is to aim for a group of 3/4 members<sup>4</sup>. Each group is expected to deliver a report that deals with a case study about the internationalization process of one Spanish firm or brand. The guidelines to produce the report are available on the course webpage.<sup>5</sup> Once the report has been completed, all member groups are expected to present their report to the rest of the class. Since the beginning of the course, students know that they will be graded individually for this activity. They also know that the final grade for this report will be equally based on the grade of the document they deliver plus their individual presentation.

The challenging point of this action is to be able to differentiate the individual contribution of each student in the writing of the report in order to properly grade him or her individually and limit the free-riding or collusion problem. In order to control for this problem, I introduced a further requirement in the official guidelines of the group project: a type of peer-norm. When producing the report, students are also expected to deliver a joint declaration in a sealed envelope. This declaration is a self-assessment of the individual's participation to the making of the report (usually in percentage of the total work) that must be signed by all the members of the group. Students know that this information will be used to determine the individual final grade for the report exercise, but they ignore the way I will use the information.<sup>6</sup>

Two remarks about the experiment: whereas in the first cohort of the experiment (groups in the academic year 2012-2013) three groups did not turn in the envelope, all the groups turned in this document during the academic year 2013-2014. As a preliminary result, this peer-norm was effective in eliminating any complaint from students about free-riding situations or internal conflict at group level. To the same extent, the norm was also effective in identifying students' participation, because the declarations allowed me to recognize a consistent number of groups that admitted an unequal split of the required tasks for producing the report.

### 3. Data and Analysis

The data gathered during the trial are summarized in **Table 1**. Overall, this involved 125 students, of whom about 40% were foreign (Erasmus) students.<sup>7</sup> As for gender composition, the group is relatively balanced, with 40% of women. The total number of groups that we are taking into consideration is 35 (in the two years) and they worked on 26 different case studies.<sup>8</sup> On average, the group consisted of four persons, and 76% of the groups declared that all members had participated identically (*equal split* variable) in the tasks assigned to the group work, but with a high variance. Statistics on the participation share (the *share partic.* variable) identify that, on average, each individual produced 30% of the group work but there are extreme cases in which a member did not collaborate and the others took care of all of the tasks (refer to statistics about the *share partic.*).

We begin our analysis by looking at some statistical significant correlations. **Table 2** displays the corresponding statistics.

Looking at our pool of data, it is possible to establish that the presence of Erasmus students is directly associated with the smallest groups (in terms of size) and, in addition, their presence is negatively correlated with the

<sup>4</sup>It is important to remember that each cohort has no less than 50 students, of whom a significant part is students coming in from other universities (mostly foreign universities). Being an elective course with more than 50 students per year, it is equally likely that the group may be composed of long-term mates or by just foreign students or a mixture of these. In this respect, it is sufficiently reasonable to think of the group formation as being quite random, because none of the previous alternatives dominates the others. Furthermore, I have no possibility to access to the students' admissions files (above all the foreign ones) and I cannot replicate the content of the experience implemented by Moore (2011).

<sup>5</sup>Available at [http://rosellanicolini.com/guidelines\\_english.pdf](http://rosellanicolini.com/guidelines_english.pdf)

<sup>6</sup>In this analysis, I am not exploiting the cardinality of the grades of each student. Cardinality will be a measure to study educational performance, but this is not relevant for the scope. A reader will be fine by knowing that all reports were graded above the minimum threshold established by the Spanish educational system to pass an exam or any other type of academic evaluation.

<sup>7</sup>As Erasmus students we identify any foreign (not UAB) student enrolled in the class. The Erasmus programme does not finance a proportion of them because they belong to some interchange agreement signed by UAB with other no EU-universities. We define them all as Erasmus since the aforementioned difference is not relevant for this study.

<sup>8</sup>As a rule, no duplication of case study is admitted in each year, but the same case study can be replicated in two different years.

**Table 1.** Descriptive statistics.

Variables	Obs	Mean	Std. Dev	Min	Max
Gender	125	0.4	0.492	0	1
Erasmus	122	0.418	0.495	0	1
Equal split	107	0.766	0.425	0	1
Share partic	107	29.104	17.341	0	100
Group size	125	4.088	1.314	2	6

Source: own data. Calculus: author.

**Table 2.** Correlations.

	Group size	Share part	Erasmus	Gender	Equal split
Share part	<b>-0.6554</b> 0.0000	1.0000			
Erasmus	<b>-0.5580</b> 0.0000	<b>0.4253</b> 0.0000	1.0000		
Gender	-0.1423 0.1135	0.0234 0.0000	-0.0503 0.5882	1.0000	
Equal split	<i>0.1753</i> 0.0710	-0.0926 0.3426	<b>-0.4009</b> 0.0000	0.1527 0.1163	1.0000
Decision topic	<b>-0.4504</b> 0.0000	<b>0.3091</b> 0.0012	<b>0.4248</b> 0.0000	-0.0311 0.7309	<b>-0.3097</b> 0.0012

Legend: Bold: coefficient significance at 1%. Italics: coefficient significance at 5% or 10%. *p*-value below coefficients. Source: own data. Calculus: author.

event of getting a (declared) equal split of the individual participation to the teamwork. As a counterpart of this effect, Erasmus students usually seem to be taking a relatively higher share of participation in the job. In addition, groups with Erasmus students seem also been more pro-active in selecting the topic of the case study (*Decision topic* variable) in a more autonomous way.

Furthermore, we also performed additional statistics to assess whether Erasmus students tend to be more pro-active in doing on average more work. We rescale the variable share part as the difference between the reported value and the equal-share value. Then, we compute the correlation between this last variables and the Erasmus one. We get no statistical significant correlation that Erasmus students are more prone to take care of the highest part of tasks in the accomplishment of the group work.<sup>9</sup>

In this line of analysis, the econometric exercise confirms the previous preliminary outcomes (**Table 3**). The values reported in **Table 3** are the regression coefficients. We consider as a dependent variable *Equal split*, namely the declared output of the task division among students. This is a dummy variable that has been built to examine whether all the members of a group split the job equally between them. The equal-share variable is a proper mechanism to control for the moral hazard problem in teams. If students anticipate that by not participating to the group work as much as the correspondent equal-share, they are taking the risk of not having their equal-share in the common declaration and, therefore, being penalized with a lower grade, then they have the right incentive to participate as much as the other group-mates. In this experience, this variable is considered to be a proxy of the typical pooling equilibrium in a signaling game in which it is not possible to discriminate among agents. Given the implementation of our peer-norm, whenever this dummy variable takes the value zero, it is the signal that each member of the group recognizes an uneven individual participation to the accomplishment of the job without incurring in any type of conflicts with the other members of the group.<sup>10</sup>

<sup>9</sup>Statistics are available upon request.<sup>10</sup>We are also running a robustness check in order to control for the potential problems associated with the independent treatment of the individuals participating to the same group activity. In **Appendix A**, in **Table A1** we report estimations when considering the group as one observation. Erasmus and Gender variables are considered as dummies for the presence in a group of at least one foreign student and a woman respectively. Results do not change with respect to the case presented in **Table 3**.



**Table 3.** Probit estimations.

	(1)	(2)	(3)
Constant	1.16 (1.44)	<b>1.09<sup>***</sup></b> (0.256)	<b>1.09<sup>**</sup></b> (0.497)
Group size	−0.007 (0.27)		
Erasmus	<b>−1.49<sup>***</sup></b> (0.456)	<b>−1.44<sup>***</sup></b> (0.48)	<b>−1.44<sup>**</sup></b> (0.644)
Gender	0.411 (0.334)	0.557 (0.534)	<b>0.557<sup>***</sup></b> (0.144)
Gender × Erasmus		−0.24 (0.674)	−0.24 (0.49)
Time dummy	Yes	Yes	Yes
Errors	White (heteroskedastic-robust)	White (heteroskedastic-robust)	Cluster (by subject) <sup>11</sup>
Log likelihood	−47.51	−47.44	−47.44
Pseudo R-square	0.18	0.18	0.18
Obs.	106	106	106

Dependent variable: **Equal split**; Std errors into brackets. <sup>\*\*\*</sup>, <sup>\*\*</sup>, <sup>\*</sup>Level of significance at 1%, 5% and 10% respectively.

The probit estimation definitely assesses that the most efficient way to differentiate the individual participation to the teamwork project is to include at least one Erasmus student in the group. This result is robust and consistent across all estimations and error corrections. In contrast, when correcting for the clustering of errors (by product-case study)<sup>12</sup>, the presence of a woman smoothes the differentiation process among the members of the group.<sup>13</sup>

The clear effect of foreign students in tempering the collusion problem is not a novelty in the literature. [Watts et al. \(2011\)](#) identified that the quality of the group work of engineering students improved during the telematic simulation when they were in contact with student teams from other countries. However, this is the first time that it has been possible to assess this effect quantitatively in an econometric exercise.

#### 4. Robustness Check: Pre-Commitment Threat

An important factor that could undermine this experiment is the potential pre-commitment agreements among students. This can be a problem not only among persons following the same undergraduate track, but also among Erasmus students if they share other courses or have other common interests, for example.

The pre-commitment option is somewhat endogenous to the culture of a society. Since my groups include peoples from different cultures and bringing very different social norms or habits, I cannot exclude *a-priori* that the norm introduced in this experience was excluding or dissuading students from this type of collusion.

Of course, this is private information and there is no direct way to assess it. However, I am able to approximate it by referring to the extra information I gathered during the course. In particular, I am referring to the additional individual report that each student is expected to produce.<sup>14</sup> After providing the group report, each student is required (as a part of the final assessment) to provide an individual report following a working scheme similar to the one followed for the group report. Therefore, if a student participates actively in producing the group report and manage a good knowledge of the data analysis in that work, they would not have any problem in working on the data analysis issues required in the individual report. Therefore, where each group member participates fully in the group report, they would be expected to get a grade for the individual report in line with the one achieved with the group report and presentation. If not, the presence of collusion among the group members must be suspected.

The sample of students providing the group and individual reports is identical. Thus, with the information at hand I created a new variable (*comm\_index*). This variable aims at detecting the potential existence of (stable)

<sup>11</sup>The case studies present a different degree of difficulty to deal with them properly. For instance, data or other quantitative information are not always public available and, if this is the case, students are expected to put more effort to accomplish the expected tasks. This further constraint makes them more concerned about the equal split of the job and in the reporting of the effort.

<sup>12</sup>This means taking into account the condition that one product-case study can be repeated from one year to another and so information may circulate among groups belonging to different cohorts.

<sup>13</sup>This result is quite novel because previous evidence usually assesses a positive discrimination versus females in collaborative homework assignments ([Parker, 2010](#)).

<sup>14</sup>More information can be found at: <http://rosellanicolini.com/exterioren.htm>.



commitment agreements among students in order to declare the equal split of the job in the case of recording an individual asymmetric participation to the group report. Accordingly, this is a dichotomy variable that takes value one, whenever a student got two different marks in the two exercises, and zero otherwise. In practice, to be relevant, this difference has to be sufficiently large (more than one point over ten) in order to identify the existence of any pre-commitment mechanism.<sup>15</sup> I ran probit estimations in order to understand to what extent the norm introduced in this trial was able to control for this collusion threat. Results are presented in **Table 4**.

We built estimations in **Table 4** by exploiting the results shown in **Table 3**. Irrespective of the type of error correction, the Erasmus variable always displays a significant negative correlation coefficient. As for the variable representing commitment agreements (*Comm\_index*) either it is not statistically significant or it is negative. In case of assuming that the reporting is accurate, no relevant difference is expected to appear between group and individual reports, therefore the *comm\_index* variable is expected to be zero. Instead, in case of recording deviations in individual scores with respect to the group one (that is a signal for the presence of pre-commitment agreements), then the expected sign for the *comm\_index* variable is negative, indeed. Our results point out the presence of potential collusion-type behavior among students that we are able to indentify when adopting a clustering correction for error. There appears to be a clear association in the case where there is a large difference in student performance in the two evaluation activities and the low probability of getting the group-declaration that assesses different individual participation rate to the group report. However, this result does not impact on the statistical significance of our key variable (namely, *Erasmus*). In this respect, the peer-norm seems being effective because the principal results are not affected by the introduction of this further control.

## 5. Conclusions

This study discusses the outcome of an experiment concerning the introduction of a peer-norm as a signaling device for teamwork tasks. Economic literature allowed formatting a peer-norm yielding to a separating-type equilibrium in a typical signaling game. The exercise turned out to be useful in implementing a mechanism to reduce conflict among teamwork members and allowed them to tailor their individual final grade to their declared participation to the teamwork activity. In this respect, the presence of foreign students in teams tempers the propensity to collude and promotes a separating-type equilibrium. The role of the foreign students is certainly driven in part by their cultural and education background. It is not certainly due to a biased selection composition because UAB (and, in general, Barcelona) is one of the preferred destinations for educational exchange-programs and we host students from all around the world without a clear dominance of one community over the others. Instead, it is possible that the structure of the program (students' stays are limited to one or two terms) makes Erasmus students be less concerned by the potential "social retaliation" of the mates and, therefore, they end-up being the less willing to collude. Then, this behavior generates a positive externality that reduces the degree of collusion in the overall cohort.

To a large extent, these results endorse the importance of maintaining the international interchange programs (as the Erasmus ones) not only for the advantages they may bring in terms of cultural exchange and cohesions in youth generations, but also as a potential effective device to limit distorting behavior in team activities.

**Table 4.** Probit estimations.

	(1)	(2)
Constant	1.81 (0.502)***	1.81 (0.625)***
Erasmus	<b>-1.54 (0.39)***</b>	<b>-1.54 (0.604)**</b>
Comm_index	-0.38 (0.25)	<b>-0.38 (0.18)**</b>
Time dummy	yes	yes
Errors	White	Cluster (by subject)
Log likelihood	-47.14	-47.14
Pseudo R-square	0.19	0.19
Obs.	106	106

Dependent variable: **Equal split**; Std errors into brackets. \*\*\*, \*\*, \* Level of significance at 1%, 5% and 10% respectively.

<sup>15</sup>The rationale behind the creation of this variable is straightforward. Being the expertise required for the two exercises identical, an individual report whose grade is by far lower than the one of the group report unveils that the author did not participated actively to the group report without accumulating the right expertise to produce the second document.

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## Appendix A

**Table A1.** Probit estimations.

	(1)
Constant	1.75** (0.76)
Erasmus	-1.52** (0.65)
Gender	-0.41 (0.334)
Time dummy	Yes
Errors	White (heteroskedastic-robust)
Log likelihood	-15.30
Pseudo R-square	0.18
Obs.	31

Dependent variable: **Group with an Equal split declaration among its members**. Std errors into brackets (White correction). \*\*\*, \*\*, \* Level of significance at 1%, 5% and 10% respectively.

# Academic Dean and the Challenges of Meeting Changing Expectations within a Competitive Higher Education Environment in Africa

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## Abstract

This article looks at the challenges involved and seeks to provide guidelines for leadership decisions and practices for the Deans that can be effective in institutions of higher learning. This paper provides an overview of academic leadership by faculty deans, and assesses the degree to which deans exhibit the behaviors embedded in this leadership in addressing the challenges and expectations of this century. Deanship is therefore treated as the academic act of building programs and a community of scholars to set direction and achieve the expectations of stakeholders in the current challenging economic times. The need for transformational leadership is emphasized. The paper shows how academic leaders must be the purveyors of ideas and knowledge that shape managerial thought and practice. Further, academic leadership needs to develop a human resource network inside and outside the departments and university and at the local, national, and international levels. Academic leadership needs to have a clarified program for faculty and staff promotion and development, and it should be placed on a priority list and agenda. Deans will need to use technology effectively and communication innovations to improve access to knowledge. Keeping pace with change in the world of work means offering education programmes that are relevant, are of high quality and, increasingly, include practical or work experience, as well as working more closely with stakeholders such as employers in course design or delivery. They will also need significantly to streamline their operations by incorporating new teaching and learning delivery mechanisms. Finally it is observed that academic leaders should take the initiative by adopting measures of success that are truly useful management tools for their institutions and that have credibility with the institution's external stakeholders.

## Keywords

Higher Education, Challenges, Academic Leadership, Innovation, Quality, Change

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## 1. Introduction

Higher education is undergoing a paradigm shift. This historically low competition industry is suddenly turning highly competitive. Collis (1999) of Yale University suggests that a number of drivers of change in higher education include: new technologies, particularly the Internet, a change in the nature of the employment contract from lifetime employment, cost increases that outstrip productivity growth and so lead to a continuing rise in the real price of education, exponential increase in the rate of accumulation of knowledge and the consequent fragmentation and specialization of academia, globalization of academic and education markets, and new competitors entering the business, both as stand-alone institutions and as companies training their own.

Deans juggle multiple roles and a myriad of expectations from diverse constituents. Squeezed from above and below as well as from inside and outside the university, deans are caught in the jaws of conflicting cultures, pressures and priorities. Constrained by traditions and tensions inherent in the role, they are increasingly accountable for outcomes over which they have little influence and less control (Gallos, 2011). The Dean of the Faculty is a senior member of the University's academic administration and is directly responsible for the recruitment, retention, and development of University faculty. The dean oversees departments and programs in the divisions within college or university. The Dean of the Faculty has a significant impact on the University's intellectual life and academic future through hiring decisions, faculty support, and strategic initiative. The dean supervises and approves all faculty searches and departmental hiring plans; works with university governance committees in hiring, reappointment, promotion and tenure. The dean convenes small discussion groups of department chairs and faculty on academic issues and initiatives; serves as the faculty's advocate within the University. Criteria of appointment to the dean's position vary from county to county and even from one university to another. Means that are used include election, direct appointment and even through competitive interview. In respect to qualification one must be of the rank of senior lecturer and above with leadership qualities. Deans are, in essence, classic middle managers: They have enormous responsibilities, little positional power, insufficient resources and limited authority.

Effective leadership in any organization is a crucial component of overall organizational success. While many aspects of management and leadership are common to most organizations, colleges and universities present special challenges in both their fundamental character and in practice. The presence of faculty and non-academic personnel in leadership roles in the same organization can create ambiguity and confusion. This is particularly an issue when units of the institution seek to achieve the highest possible level of performance, cooperation and mutual trust among and between them (Rowley & Sherman, 2003).

A study carried out by Wolverson and Gmelch (2002) established that there are three activities deans must perform to lead effectively: building a community of scholars; setting direction; and empowering others. Overall, deans were found to be balanced in their approaches to leadership, with deans in comprehensive universities more likely to describe themselves as community builders than deans in research universities. It was further revealed that after about year 10, deans tend to disengage in direction setting behavior, a finding that may have implications for institutional development.

The academic deanship is the least studied and most misunderstood position in the academy. The work of administration and the pursuit of scholarly endeavors results in paradoxical situation causing many academic leaders to burn out from the strain of trying to be effective administrators, on the one hand, and attempting to protect the academic autonomy and independence of faculty on the other (Gmelch, Wolverson, & Marvin, 1999). Much of the work of colleges and universities gets done at the academic departmental and faculty level. Yet, most institutions of higher learning pay little attention to either the preparation of academic department leaders or their succession into the position or even the enormous significant works that Deans do.

Deans usually come to their positions without leadership training, without prior executive experience, without a clear understanding of the ambiguity of their new roles, without recognition of the metamorphic changes that occur, and without an awareness of the toll their new position may take on their academic and personal lives. In spite of all these the deans are expected to steer the academic leadership and offer direction to both students and lecturers to their satisfaction. They are therefore expected to promote scholarship, protect higher learning from stagnation and interference, and provide a sound basis for hiring and advancing faculty in meeting the demands of the economy. In light of this scenario there should exist operating alternatives to conventional way of thinking and running faculties (Gmelch, 2000).

The current wind of change in Africa that is coupled with overpopulation and high rate of unemployment is making stake holders to turn their figure and question the quality of education in higher institutions of learning.

This is a big challenge to the deans. Up skilling is not just something that allows people to get a better job: it is also what enables them to shape the jobs of the future, and thus to actively contribute to an innovative economy (Waters, 2012). So we need not just quantity—we need quality too and for graduates to leave higher education with relevant qualifications and transversal and transferrable skills.

Deans in Universities and higher education institutions need to be flexible, to specialize and to unlock potential of those they lead in order to address the challenges of the 21<sup>st</sup> century. They are expected to offer transformational leadership that focuses on:

- Improving the quality and relevance of education programmes to increase graduate employability and to meet the demand for people with high-end skills. This stresses the importance of adapting programmes so that each graduate, whatever their discipline, has a good mix of sector-specific and cross-cutting skills to enable them to thrive in a labour market.
- Improving quality and raising skills through mobility and removing the obstacles that hinder mobility.
- Encouraging higher education institutions to develop a stronger role in supporting sustainable growth in their regions and beyond.

## 2. Theoretical Framework

The present study uses the theoretical framework of transformational leadership to understand the behaviors and practices by which Deans mentor lecturers, influence students and develop programs, monitor quality and initiate innovation with an aim of addressing future challenges. Sometimes lecturers may not consciously be aware of their transformational leadership qualities, but their behaviors in the classroom are similar to those same tenets of transformational leadership. An example of transformational leadership could be a Dean who attempts to stimulate and inspire lecturers and students to accomplish great things and develop their own capabilities required to manage prospective challenges. Transformational leaders seek to challenge the process and practice. They accept and embrace challenging opportunities that direct others to greatness.

Transformational leadership occurs when leaders broaden and elevate the interests of their employees, when they generate awareness and acceptance of the purposes and mission of the group, and when they stir their employees to look beyond their own self-interest for the good of the group (Bass, 1990). Deans should demonstrate transformational leadership behaviors empower teachers to rise above their personal expectations and help create and encourage belief in common goals. According to Bandura (1993), the stronger the faculty's shared beliefs in their instructional efficacy, the better the students performed academically. High levels of perceived collective efficacy are associated with a robust sense of purpose that helps groups see setbacks as temporary obstacles to be overcome rather than evidence confirming their inefficacy (Goddard & Skrla, 2006). Agreeing with these views Ross and Gray (2006), argue that transformational leadership contribute to collective efficacy of lecturers by setting feasible goals, clarifying standards, developing a collaborative school culture, and linking actions of lecturers to student outcomes, a principal influences.

A leader can make a significant impact on the product of the organization. He or she can improve the educational and research infrastructure, and thereby improve the products of these efforts. Deans can foster development of faculty, staff and students to improve the quality of work as well as morale. Improving the quality of education and student mentoring can result in higher student retention and more successful graduates, which is a key factor in how Deans are judged. Deans can also be catalyst for organizational change. If you have something special to bring to your unit including improving diversity, increasing the focus on teaching and learning, developing centers, or increasing interdisciplinary work, leadership provides an opportunity and resources for effecting such changes. Transformational leaders passionately believe that they can make a difference by envisioning the future and creating an ideal and unique image of what universities can become (Kouzes & Posner, 2002).

## 3. Academic Leadership

Deans as academic leaders exercise their leadership within settings that have markedly different institutional purposes, cultures and expectations than the organizations in which business leaders typically exercise their leadership. Leadership operates within the framework of purpose: vision, shared values, and common cause. The leader does not have to create the vision, but there must be one, and it must be shared by others who willingly commit themselves in common cause (Diamond, 2000). Scott Cowen, President of Tulane University, laments

the decline of the academy as the largely unchallenged bastion of intellectual leadership: “As academic leaders, we must be the purveyors of ideas and knowledge that shape managerial thought and practice”. Executives and organizations should be looking to universities and their faculties to provide the direction and knowledge necessary for organizations to adapt to the changes they are undergoing. All too often, however, we have been looking to industry to give us direction rather than vice versa. Deans therefore must reclaim the intellectual edge if they are to demonstrate continued leadership in the learning domain and provide value to the students and the organizations they seek to serve.

Leadership is thus crucial if faculties have to make a change in this century as Bennis (1985) puts it in *Leaders: The strategies for taking charge*, “business short of capital can borrow money, and one with a poor location can move. But, a business short on leadership has little chance for survival.” Brown (2011) suggests that advocacy and leadership bring about genuine change by using evidence-based practice and current research to convince people of the value of the changes you want to make and to make sure that the changes you are making align fully with the institution’s overall ambitions. In showing transformational leadership in universities Deans are expected to keep abreast of national and international developments in assessment, learning and teaching, prioritizing innovations and good ideas that form the context in which they are working and also to model good practice in their own teaching and assessment.

Programme leaders hold a pivotal role in universities in ensuring that strategic imperatives are translated into action rather than being rhetorical ambitions. Deans as senior managers should work closely with programme leaders. This can be a very powerful partnership that can bring about real change in universities (Brown & Denton, 2009). Effective academic leadership needs to utilize communication skills, organizational culture, and shared values in order to fulfil mutual trust. Consequently, the interests of faculties, staffs, and leaders converge toward common organizational aims. Leaders should not only direct reciprocal communication, but also provide an effective communication network inside and outside universities. Mutual trust and respect provide an appropriate context and move the organization toward individual and collective goal attainments. Academic leadership should be transformational and collaborative, emphasizing participation, delegation, and teamwork. Driven by the dynamic nature of the academic environment, recommendations for acceptable management based upon an increased utilization of teams and workgroups with multidisciplinary collaboration at local, regional, and international levels should offer a decreased reliance on traditional authority arrangements.

#### 4. Faculty Development

Leadership is about evoking high individual performance in others and if effectively exercised, it will result in a team of people who enjoy clear purpose, shared values, who are empowered by knowing that their initiatives are aligned with and supported by team members, and who believe that there is mutual benefit deriving from their individual commitments in turning their common vision into reality (Diamond, 2000). In order to succeed at new teaching, research, and leadership tasks, faculty development is essential (Bikmoradi, 2008). “Management is about human beings. Its task is to make people capable of joint performance—to make their strengths effective and their weaknesses irrelevant” Says (Drucker, 2011).

Successful organizations tap into individuals’ intrinsic motivation, thereby enabling a self-sustainable commitment to quality and continuing improvement. The idea is to foster initiative, leadership and accountability throughout the organization—leadership that does not depend wholly on organizational position and formally designated authority. Deming strongly debunks reliance on extrinsic motivators—reward and punishment, fear and incentives—as short-term, no sustainable practices that rob people of their self-esteem and dignity. Although we believe that extrinsic motivators do influence behavior, we see them as only one component of many structural elements that must continuously be aligned with mission (Diamond, 2000).

*“When an institution, organization or nation loses its capacity to invoke high individual performance, its great days are over” —John W. Gardner Excellence*

Academic work is facilitated through inspired and shared clear vision, goals, and strategies, consistently pursued and communicated with integrity, an understanding of individual needs, and energetic commitment. Academic leadership needs to develop a human resource network inside and outside the departments and university and at the local, national, and international levels. These networks could create an effective academic leadership on learning, teaching, and research processes (Bikmoradi, 2008). An effective and efficient reward system with appropriate and on time feedback should be able to improve output of academic work, according to possible results of an efficient evaluation system focusing on staffs, departments, and school performance. Academic lead-



ership needs to have a clarified program for faculty and staff promotion and development, and it should be placed on a priority list and agenda.

A campus culture that values collegiality and civility is among the most important contributions a university can make. Academic departments recognize the desirability of a collegial environment for faculty members, students, and professional employees and that such an environment should be maintained and strengthened throughout the university. In an environment enhanced by trust, respect, and transparency faculty members can be revived so that they can play an active and responsible role in academic matters (Cipriano, 2012).

What deans should strive for in the academy is a healthy and respected sharing of ideas and concepts where people feel free to express their divergent and oftentimes conflicting views. In fact, many historians consider this concept to be one of the hallmarks of higher education. Facilitating a culture of collegiality can be the synergistic agent of good relationships among members of a department—which all too often is severely missing. In addition deans should make an effort to ensure that academic citizenship is demonstrated through the service that faculty members perform on various types of committees, in their professional organizations, through their uncompensated civic engagement, and through other professional efforts that benefit the community. Furthermore, it is manifested in excellent teaching when faculty members go above and beyond their contractual obligations to act as mentors to their students, and in superior research when they participate in collaborative efforts, scholarship networks, and multi-institutional academic partnerships (Buller, 2010).

## 5. Research and Instruction

Every year, millions of students enter universities and higher education colleges. They are ready to start a new chapter of their lives and hope to acquire the knowledge and skills that will equip them for future careers. Many arrive with fresh memories of the teachers who inspired them to go on to higher education—and the teachers they are about to meet will be just as important for their success. Yet relatively few countries invest systematically in efforts to improve the quality of university teaching. Instead, university excellence is mostly conceived of in terms of research performance, as confirmed by the growing influence of current university rankings, based mainly on research output (Vassiliou & McAleese, 2012).

Drucker (2011) observes that “the single most important thing to remember about any enterprise is that there are no results inside its walls. The result of a business is a satisfied customer, the result of a hospital is a healed patient, and the result of a school is a student who has learned something and puts it to work ten years later. Inside an enterprise there are only cost centers. Results exist only on the outside”. Education institutions are so focused on getting students in the door that they lose sight of how to prepare young people to succeed in today’s tough labour market. “As a matter of fact it looks like Education providers are much more motivated to focus on getting youth onto campus and less focused on how to prepare youth to exit.” (Millar, 2012). Reflecting on this John Dewey an educationist and a philosopher says “One might as well say he has sold, when no one has bought, as to say he has taught when no one has learned”.

It is time to re-evaluate the idea of the university in fact if you examine the mission statement of almost any institution of higher education, you’ll discover that teaching and research are listed as important but not necessarily related functions of the organization. In other words, relatively few mission statements present learning as a goal achieved through independent inquiry and research; even fewer describe discovery, integration, and application as results actively sought through teaching. Once again, the focus is on the activity rather than the result, and that perspective shapes everything that is familiar about the modern university (Buller, 2012). In almost all universities you will notice that:

- Departments are organized around disciplinary methods (activities) rather than important questions being asked or issues being explored (results).
- Individual courses are defined by “seat time” and contact hours (activities) rather than competencies gained and knowledge developed (results).
- Degrees are granted largely by the number of credits earned (activities) rather than the amount of growth achieved or improvement attained (results).

Chu (2006) says that an academic department should be regarded as an “open system” in which both the stakeholders and beneficiaries are numerous: faculty members, students, alumni, parents of current students, accrediting agencies, prospective employers of graduates, nongovernment organizations, funding agencies, and so on. Re-evaluating the idea of the university will mean approaching it not as a closed system in which professors teach and conduct research, but as an open, organic network that includes a vast system of constituents and



stakeholders. It is rapidly becoming accepted that there are alternative models for describing how students learn. It should be equally clear that alternative models also exist for describing how universities and university systems produce benefits for society. In what is perhaps the most comprehensive approach to promoting research while advancing instruction to date, [Jenkins, Healey, and Zetter \(2007\)](#) describe six effective strategies that deans can adopt in order to make timely progress in attaining this goal.

1) Work through individual disciplines to develop a clearer understanding of how teaching and research intersect in their own practices and methods.

2) Review areas where current culture seems to inhibit the cross-fertilization between teaching and research, and revise policies where appropriate. Assessment data, student surveys, organizational audits, and comprehensive program reviews can all provide helpful information in this regard.

3) Develop an institution-wide set of curricular goals for promoting research among all students, even at the undergraduate level.

4) Modify staffing policies so that future hires are likely to support the full integration of teaching and research.

5) Revise strategic planning goals and categories so that teaching objectives and research objectives better support one another.

6) Incorporate a fully integrated approach toward teaching and research into institutional culture. For instance, incorporate assessment of research knowledge into curricular assessment, encourage research clusters to become teaching teams, and give research wide visibility to students at all levels of the institution.

Deans could properly consider “high impact learning” which comes from [Kuh, Kinzie, Schuh and Whitt \(2005\)](#)’s work with NSSE [National Survey of Student Engagement]. They are particularly beneficial for students in terms of academic and personal growth, career development, and a wide range of desired learning outcomes ([Kelly, 2012](#)). There’s something unique about high impact learning. It seems to have a greater impact than what we’re used to. The type of learning tends to be very intense, not simply students walking into a lecture hall and hearing a lecture but students being required to learn on multiple levels. They’re creating new knowledge, implementing it in real-life settings, and reflecting on the implications for themselves and the community.

It said that “transversal skills such as the ability to think critically take initiative, problem-solve and work collaboratively will prepare individuals for today’s varied and unpredictable career paths”. It is “teaching that primarily influences student outcomes, enhances graduate employability and raises the profile of African higher education institutions worldwide; this should be the core business of the deans. Learning at the postsecondary level includes not only the knowledge and skills that students gain from their formal course work but also the discoveries they make through their independent research. In other words, the revolution begun by [Robert Barr and John Tagg \(1995\)](#) has changed the way we look at what students do at a college or university, so why do we still insist on looking at teaching, research, and service as separate activities, rather than evaluating the learning that results from all three?

## 6. Programs

Many challenges confront universities and to thrive, or even to just survive amid these challenges, requires that the academic unit be continuously aligned with the changing needs of the constituencies that it serves: its students, alumni, employers, its university, and the larger academy ([Diamond, 2000](#)). No academic unit can be successful for long if it isolates itself from knowledge of its constituencies’ changing needs or fails to maintain value-adding relevance within its scholarship, education programs and services. Escalating demands for change and accountability reflect growing dissatisfaction with the way university graduates are prepared for the challenges and continuing development that will characterize their lives and their professional careers. There are vigorous calls for innovation in curriculum, learning methods and education program delivery and this should be the concern of deans if they have to excel as academic leaders.

“Statistics in universities suggest that the share of the working population with a degree or above is going to increase, so we not only need to ensure we’re producing more graduates but also that the graduates we produce have the competences and skills which are in demand,” (Dennis Abbott as quoted by [Osborn, 2012](#)). People will need to move around more and that’s one reason why we say we need to produce graduates who are much more versatile. African universities must align more closely with labour market needs to ensure graduates have the skills and knowledge demanded by employers. “In the continent higher education is expanding rapidly and when you expand so rapidly misalignment between higher education and the labour market grows” ([Sharma, 2012](#)).

Higher education systems and institutions are under pressure to reform, to provide adequate skills and knowledge for the evolving labour markets. This is increasingly important in countries which are moving towards middle-income country status and aspiring to become knowledge economies, increasing the demand for higher skills. The problem is that the workplace is no longer a stable, hierarchical structure. So the most important skill in the 21st century is adaptability. The current scenario is that universities are not accustomed to taking responsibility for employability. That stance is rapidly changing and universities must get ahead of the curve, deans must elevate employability to an issue for students to consider in their first year of study. Empowering and preparing citizens for a greater role in development and innovation should remain the main purpose of faculties. Deans must enter into collaboration with industry, the private sector and the civil society to improve labour market links in enhancing training programs.

If we want to ensure that everyone who can go into higher education does so, and that our universities equip their students with the right skills, we need change—we need a change of culture. Curricula must meet the needs of a diverse student body and provide skills that are sought after by employers (Vassiliou & McAleese, 2012). Universities need to use technology effectively and communication innovations to improve access to knowledge. Keeping pace with change in the world of work means offering education programmes that are relevant, are of high quality and, increasingly, include practical or work experience, as well as working more closely with stakeholders such as employers in course design or delivery.

## 7. Innovation

Albert Einstein once observed, “The world that we have made, as a result of the level of thinking we have done thus far, creates problems that we cannot solve at the same level of thinking we were at when we created them”. African universities have not adequately prioritized innovation and creativity as an important learning outcome. Policymakers and educators need to do more to build faculties’ capacity to compete and innovate by investing in critical skill sets and basic research. Institutions as well as government agencies have failed to sustain and nurture innovation in our colleges and universities. Results of scholarly research on teaching and learning are rarely translated into practice, especially for those working at the grassroots level in fields such as teacher preparation and math and science education.

If universities were re-structured according to interdisciplinary emphases and topics, we would foster innovation more efficiently: At a time when innovation occurs increasingly at the intersection of multiple disciplines (including business and social sciences), curricula and research funding remain largely contained in individual departments. At present the standard division of faculty labor into three categories of activity—teaching, research, and service—is so common that most academics regard it as fundamental to the very way in which higher education works (Buller, 2012). The fact is that broadening the definition of scholarship and recognizing that important learning takes place all throughout the university, while important first steps, simply don’t go far enough in helping institutions address what faculty members actually do in their work today.

Innovation may be observed when faculty members discover and apply new knowledge, develop or perform creative works, and engage in entrepreneurial activities either in their discipline or in service to the institution. In addition, innovation may be regarded as including educational improvements that lead to enhanced student learning, original ways of serving their community or profession, and programmatic advances that make a college or university more distinctive.

Universities will not survive the next 10 to 15 years unless they radically overhaul their current business models. Maslen (2012) observes that a challenging report released by international professional services company Ernst & Young, claims that the current university model Vassiliou a broad-based teaching and research institution with a large base of assets and back office Vassiliou will prove unviable in all but a few cases. Academic deans will need significantly to streamline their operations by incorporating new teaching and learning delivery mechanisms, “a diffusion of channels to market, and stakeholder expectations for increased impact”. The report identifies the main drivers of change it says will inevitably bring about a transformation of higher education. These are:

- The democratization of knowledge as a consequence of massive expansion of online resources.
- The contestability of markets and funding as a direct consequence of declining public investment and the adoption of market design policies to fund and regulate higher education.
- Digital technologies changing the way courses are delivered.
- Global mobility of students and staff.

- Integration with industry to differentiate programmes (through work-integrated learning) and to support and fund applied research.

“Current university models are living on borrowed time” observes Maslen; government funding is tight and is going to be tighter still in the next couple of political cycles. While they are not exactly businesses, they will have to run like businesses. They need to be lean and mean. Deans should critically assess the viability of their institution’s current business model, develop a vision of what a future model might look like, and develop a broad transition plan. Academic units must choose 1) which market segments their graduates will target; 2) what the nature of their programs will be (undergraduate, MBA, specialized master’s, Ph.D.); 3) what competencies they will focus on (leadership, technology, systems expertise, international); and 4) what learning methodologies (lecture, experiential, distance, cooperative, service) they will employ. Making choices like these will enable the academic unit to focus its always scarce resources in recruitment and deployment of faculty, in the development of learning processes, in the application of technology, and in building alliances both with external constituencies and within its university (Diamond, 2000).

*“Strategy implementation is more about commitment than correctness. An excellent strategy with adequate implementation will always lose to an adequate strategy with excellent implementation”.—Michael Davidson  
The Transformation of Management*

## 8. Quality

Sawahel (2012) says that while quality assurance is developing rapidly in African higher education, it is still at a formative stage in many countries, and only 19 out of 55 states have a national quality agency, according to a report just published by the European University Association. Some long-standing academic leaders may remember that once-upon-a-time when universities enjoyed a highly honored status in the society, a time when society intuitively embraced the academy’s mission and supported it generously, largely without questioning what went on within the closed walls (Diamond, 2000). As the challenges of this century begin to bite, many in higher education view themselves as under siege., higher education’s relevance in preparing individuals for living a life and earning a living in society is being challenged.

The quality of teaching in higher education institutions is key to unlocking the full potential of students and creating a healthy economy and society. High caliber teachers, and the institutions and systems that support them, clearly impact on these challenges. Its starting point is that higher education is ever more crucial in creating and sharing the high-end knowledge and skills Africa needs. Excellent higher education is a source of competitive economic advantage and, at a time of crisis, a key to sustainable economic recovery (Vassiliou & McAleese, 2012). Higher education is also a major driver of social progress as it trains graduates to respond creatively to challenges. At the same time, competition between universities increases as the quality of higher education improves around the globe. The knowledge economy means that the nature of jobs will change dramatically and that graduates will need constantly to update their knowledge and acquire new skills.

Universities are experiencing growing expectations and increased accountability for the outcomes they produce, i.e., credible evidence that their students are learning, that their scholarship is relevant and value-adding, and that their service is more than just time spent, but actually produces results that are beneficial to the institution’s stakeholders:

- The clamor for accountability is loudly heard in public policy arenas and in decisions, from trustees having stewardship responsibility for the institution’s effectiveness, and from individual, business and foundation donors who underwrite a substantial portion of the university’s costs.
- Paying customers, i.e., students, parents and employers, are increasingly looking for outcome measures, comparative statistics and assessments that will inform their decisions about where to buy.
- Accreditation processes, peer rankings and media rankings send universities scrambling to compile credible evidence of their comparative worthiness in the competition for recognition and respectability.

There are substantial risks for the university that finds its measures of success being dictated solely by the pressure to satisfy these external demands for outcomes measurement (Diamond, 2000). First, there is the risk that the success measures may be driven by fickle, changing sets of priorities from ever changing sets of stakeholders, and thereby become unfocused, unconnected, and possibly even inconsistent, with the specific mission of the university. Second, there is the risk that the university’s chosen measures will be focused on outcomes alone, and may largely ignore the drivers of those outcomes (the essential core processes of the university).

Academic leaders should take the initiative by adopting measures of success that are truly useful management

tools for their institutions and that have credibility with the institution's external stakeholders—measures that genuinely inform decisions about enrollments, faculty hiring and development, program and curriculum development, and resource allocations (Diamond, 2000). Given the complexity of the academic enterprise, and the diversity of its customers and stakeholders, multiple sets of measures are required. These measurement sets may be quantitative, including monetary and statistical data, qualitative, including peer review and customer/stakeholder judgments, and/or comparative, including benchmarking against peers and tracking performance results over time.

## 9. Conclusions

The current challenges require deans to do things differently, shedding smaller and inefficient activities and concentrating on more strategic initiatives in their leadership through helping institutions to modernize their educational offerings and their ways of working, and specific Knowledge Alliances between higher education institutions and businesses, promoting innovations in designing new curricula and qualifications and fostering creativity and entrepreneurship.

In addressing the challenges of the 21<sup>st</sup> century Deans will have to show willingness to challenge the system in order to turn ideas into actions and to get new products, processes, and services adopted. They should seek out challenging opportunities that test their skills and abilities and look for innovative ways to improve their organizations in readiness for the future. Transformational leaders are therefore willing to change the status quo (Abu-Tineh, Khasawneh, & Omary 2009). Deans must reclaim the intellectual edge if they want to demonstrate continued leadership in the learning domain and provide value for the students and the organizations they seek to serve.

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# The Literature Review of Algebra Learning: Focusing on the Contributions to Students' Difficulties

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## Abstract

This paper reviews the research literature with respect to the contributions to the students' difficulties in their algebra learning in order to understand the students' difficulties in algebra learning. To start with, 29 articles selected from the database (ERIC) are categorized into a taxonomy which has been generated from the research literature, which falls into five categories including: algebra content, cognitive gap, teaching issues, learning matters, and transition knowledge. The challenges that students confront with under those categories are unpacked in the review process. In addition, the five categories adopted in this paper could serve as a framework of better understanding students' difficulties in their algebra learning. Finally, the research gap from the literature review is discussed.

## Keywords

Algebra Learning, Equation, Cognitive Gap

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## 1. Introduction

Algebra has been recognized as a critical milestone in students' mathematics learning. However, it has been noted that many students created a serious barrier in the algebraic problem solving and formal algebraic system (Kieran, 1992). Therefore, there has been a great attention paid to addressing students' difficulties in algebra learning. This paper is going to review the research literature that bears on the contributions to the students' difficulties in their algebra learning.

In order to evaluate the related literature, 29 articles are selected from my database searching and then categorized into a taxonomy (see **Figure 1**) including the five categories: algebra content, cognitive gap, teaching is-

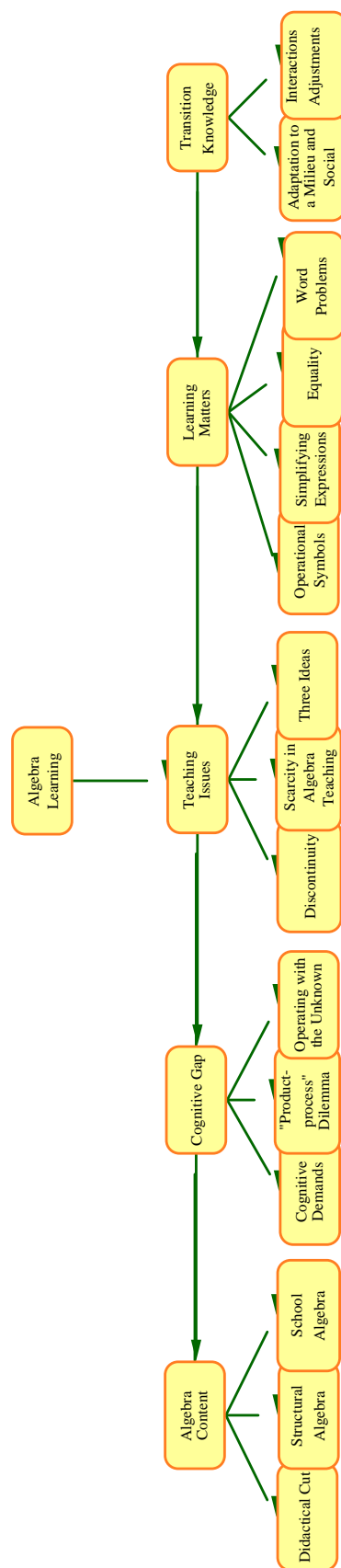


Figure 1. Taxonomy of literature review.



sues, learning matters, and transition knowledge. After that, the taxonomy is used to conduct the whole literature review. Within the taxonomy, each category is not independent. For instance, the category of algebra content is the knowledge base for the other four categories. Meanwhile, one of the articles could be coded into more than one category. For instance, the article “Kieran (1992)” is coded into four categories such as algebra content, cognitive gap, teaching issues, and learning matters.

Even though the development of taxonomy is not exhaustive, but it provides a perspective of viewing the contributions to the students’ difficulties in algebra learning within the broad ranges, such as mathematics development, school curriculum, teaching practice and students’ learning, and so on.

The rest part of this paper focuses on synthesizing and evaluating the existing researches according to the categories demonstrated in the taxonomy. As for the structure of the synthesization and evaluation, discussions will be made 1) on the didactical cut, structural feature of algebra and the characteristics of school algebra in section 2-algebra content; 2) on the cognitive demands from algebra learning, product-process dilemma, and the students’ difficulties in operating with the unknown in section 3-cognitive gap; 3) on the discontinuity between primary arithmetic and secondary algebra, scarcity in algebra teaching, and three ideas from China and Singapore in section 4-teaching issues; 4) on the students’ difficulties in operational symbols, simplifying expressions, equity, and word problems in section 5-learning matters; and 5) on the needs required by the transition from arithmetic to algebra such as adaptation to a milieu and social interactions and adjustments in Section 6-transition knowledge. Finally, the summary and the research gap are provided in Section 7.

## 2. Algebra Content

This category centers on the discussion about the nature of algebra including the didactical cut and structural essence presented in the historical development of algebra. Certainly, school algebra is, to a large extent, influenced by these facts.

### 2.1. Didactical Cut

Filloy and Rojano (1989) defined one of the fundamental ruptures between arithmetic and algebra is a didactical cut. The notion referred to the transition that occurred as students face such equations as  $ax + b = cx + d$ . Students could successfully solve the equation as  $ax + b = c$  using reversal operation as subtracting B from D and dividing by A. This type of equation was called by them as “arithmetical” (p. 19). The reversal operation is not applicable for the non-arithmetical equations as  $ax + b = cx + d$ . In order to solve such equations, students have to resort to a truly algebraic idea of operating the unknown (Radford, 2012). Operating the unknown requires students to think analytically, treating the unknown as if it is known (Radford & Puig, 2007). This view provides a specific situation which requires the transition from arithmetic to algebra. Certainly, such requirement stems from the structural nature of algebra.

### 2.2. Structural Algebra

Kieran (1992) had offered a historical account of the development of algebraic symbolism and its transformational rules, which emphasized the distinguished features of letters between representing unknowns in equation solving and representing givens in expressing general solutions. Furthermore, Kieran (1992) analyzed that the development of algebraic symbolism demonstrated a change from a procedural to a structural perspective on algebra. Meanwhile, the structural development of algebra has a considerable impact on school algebra learning.

### 2.3. School Algebra

In school mathematics, arithmetic is normally treated as numerical computations (Sfard & Linchevski, 1994). Arithmetic method is used to carry out one or more operations with given numbers to achieve a solution. For elementary algebra, its need is to define the relationships between the unknown and the known data in a problem. As Sadovsky and Sessa (2005: p. 90) pointed out, “the ‘object’ of arithmetic in primary school is numbers, whereas elementary algebra focuses on relationships between quantities”. It is also shown that students’ prior exposure in computing binary operations does not prepare them very well to handle algebra (Banerjee & Subramaniam, 2012). For instance, students often apply procedures that have been employed in arithmetic context to simplify algebraic expressions and make the similar mistakes (Fischbein & Barash, 1993).

It is the existing facts in algebra learning that the three categories are the basic barriers and requirements for students' algebra learning. Therefore, those facts will be involved in other sections, which also demonstrate that the category of algebra content is the foundation of the other categories.

### 3. Cognitive Gap

Cognitive gap is an obvious obstacle for students' successful transition from arithmetic to algebra as Sfard (1991) suggested. Such cognitive gaps demonstrated from the previous researches are mainly cognitive demands, "product-process" dilemma, and operating with the unknown.

#### 3.1. Cognitive Demands

Learning algebra requires students to take symbolic representations with little or no semantic content as mathematical objects and operate on these objects through processes that usually do not produce numerical solutions (Kieran, 1992). It also requires students to modify their prior experiences in arithmetic context and represent the relationships between quantities in word problems with inverse operations used in arithmetic context (Kieran, 1992). It is clear that the cognitive demands for different operations and representations involved in algebra are intellectual struggles.

#### 3.2. "Product-Process" Dilemma

One cognitive problem was identified by Davis (1975: p. 18) as "name-process" dilemma. The dilemma could be interpreted by the duality "product-process" proposed by Sfard and Linchevski (1993). For instance, an expression such as  $8a$  is both a product for an answer (name) and a process-multiplying 8 by  $a$ . Herscovics and Linchevski (1994) showed that, in a teaching experiment, even after instruction, some students could not recognize  $8 \times a$  as the area (name or product) of a targeted rectangle unless it was embedded in the area formula " $S = 8 \times a$ ". Thus, even after an instruction of elementary algebra, students often experience difficulties in operating on a letter representing an unknown in an equation.

#### 3.3. Operating with the Unknown

In order to examine students' experiences in operating the unknown, Linchevski and Herscovics (1996) used equations with only one occurrence of the unknown (e.g.  $ax + b = c$ ) and equations with two occurrences of the unknown on the same sides (e.g.  $ax + bx = c$ ) and on different sides of the equal sign (e.g.  $ax + b = cx + d$ ) to examine the shift in students' procedures. It was found that students could spontaneously group terms that were purely numeric rather than terms in the unknown, which mean "students could not operate spontaneously with or on the unknown" (Linchevski & Herscovics, 1996: p. 41).

In addition, during the process of indicating a clear demarcation between arithmetic and algebra, Herscovics and Linchevski (1994) revealed a difficulty of such pre-algebraic nature as a tendency to detach a numeral from the preceding minus sign in the grouping of numerical terms. For example, in  $4 + n - 2 + 5 = 11 + 3 - 5$ , students often add 2 and 5. The high incidence of this mistake demonstrates that the problem is not only common but reflective of unsuspected cognitive obstacles as Herscovics (1989) commented.

It could be drawn to conclusion that the cognitive demands are general requirement from the nature of the algebra. "product-process" dilemma and operating with the unknown stem from the common fact—a letter representing an unknown, which is also part of facts of algebra. Therefore, it could be considered that the cognitive gap is brought about from the nature of algebra.

### 4. Teaching Issue

Limited is the literature on the teaching issues related to the students' difficulties in algebra learning as Kieran (1992) commented. Nevertheless, the limited literatures are sorted into three categories: discontinuity, scarcity in algebra teaching, and three ideas.

#### 4.1. Discontinuity

The traditional arithmetic pays attention to training students' fluency and accuracy in algorithmic computations.

While in algebra, students need to have the knowledge and capability of transforming equivalent algebraic expressions. Napaphun (2012) showed that the discontinuity between elementary school arithmetic and the algebra learnt in upper grades was serious. For instance, he mentioned that regarding to the concept of the equal sign, students in most elementary schools were taught to understand the equal sign as a symbol of the calculation. Thus, students habitually thought that an equal sign was always followed by an answer. In fact, recognizing the relation expressed by the equal sign is crucial for algebra learning as Freiman and Lee (2004) suggested.

## 4.2. Scarcity in Algebra Teaching

Kieran (1992) commented that there was a considerable scarcity not only of teaching models but also of researches on teachers' beliefs and attitudes in algebra. For instance, she mentioned that the teaching models of algebra were not regarded as the way in a different light from ones of arithmetic or geometry. And the teaching of algebra was inclined to focus on such pedagogical issues as the time spent on whole-group instruction or group work, teaching for procedures or understanding, and constructivist or behaviourist approaches to teaching. She further commented that except for the common pedagogical issues, algebra teachers, as other subject teachers, tended to follow a textbook. There are few reports to deal specifically with algebra teaching.

In addition, Rachlin (1989) furthermore pointed out that there was a need for research on algebra curriculum from both content and teachers' perspectives. It is not sufficient to modify the algebra content in the textbook in terms of teachers' heavy reliance on the textbook to change algebra teaching. He suggested that we must understand the nature of teachers' beliefs and attitudes and the roles these beliefs and attitudes play in their teaching. Therefore, exploring the teaching of algebra in some Asian countries such as China and Singapore is a very expedient approach to address teaching strategies in terms of the distinguished performance by the students in those countries in international tests.

## 4.3. Three Ideas

Recently, Cai and Moyer (2008) commented on the algebra teaching in China and Singapore for purpose of increasing American teachers' knowledge and ability to develop students' algebraic thinking since mathematics achievement in United States was consistently lower than that in those countries. The review suggested that three ideas from Chinese and Singaporean teaching emerging in their reviews were: 1) relating reverse operations to equation solving in Chinese teaching; 2) pictorial equation solving illustrated in Singaporean teaching; and 3) using both arithmetic and algebraic approaches to solve problems in Chinese teaching. Those three ideas were further analyzed by Cai and Moyer (2008) to understand their benefits for students' transition from arithmetic to algebra according to Kieran's (2004) five adjustments for successful transition. It was evidenced that the three ideas had matched with four of the five adjustments. Here, the three ideas are highlighted as a reference for the barren teaching consideration.

The discontinued teaching between arithmetic and algebra is very common in many countries. However, some ideas are verified to be effective in algebraic teaching in China and Singapore, which is the contribution to the scarcity in algebraic teaching.

## 5. Learning Matters

There is large bulk of researches bearing on students' algebra learning, particularly on students' misconceiving of various concepts in school algebra. It has been typically indicated from the literature we have targeted that students lacked the relevant understanding of operational symbols, simplifying expressions, equality and equation solving. All the evidence are provided from the following discussions.

### 5.1. Operational Symbols

Booth (1984) reviewed that school algebra was sometimes taken as generalized arithmetic. This meant that the general statements in algebra represented given arithmetical rules and operations. Therefore, students' prior experiences of using symbols in arithmetic would impact on their understanding of the meaning associated with formal symbols in algebra. For example, plus sign is typically interpreted as actions to be operated in arithmetic, which is not used in algebra (Behr et al., 1980). Specifically, Booth (1988) pointed out that, in arithmetic, students were taught to present answers in a single term, such as  $3 + 5$  was not an acceptable answer. Thus, stu-

dents were unlikely to recognize  $a + b$  to represent a total number of items in two sets owning  $a$  and  $b$  items, respectively, which further meant that students were unable to regard  $a + b$  as a mathematics object in algebra.

In addition, Kiichemann (1981) carried out a large-scale study to examine students' interpretations of literal terms. He found that a great deal of students (13 - 15 years old) could interpret letters as specific unknowns rather than as generalized numbers. His further finding was that majority of students treated letters as concrete objects or overlooked them, which meant that many students were unable to interpret literal expressions as numerical input-output procedures—the first stage in Sfard's (1991) developing process of a structural conception of algebraic expressions.

## 5.2. Simplifying Expressions

Greeno (1982) conducted a study with beginning algebra students to test their conception of structure of relations in problems. He found that students were short of structural understanding of algebra. For instance, they partitioned algebraic expressions into separately component parts. And more often, students' operation of simplification seemed to be quite at random. For example,  $4(6x - 3y) + 5x$  was simplified as  $4(6x - 3y + 5x)$  at one time, and as  $4(6x + 5x) - 3y$  at another time.

Wenger (1987) also described the students' arbitrary strategies when they dealt with simplifications due to the fact that they could not recognize the right things in algebraic expressions. And students were incapable to transform the simplification knowledge they had learned in one context, as polynomials, to another one, as radicals.

Another typical error in simplifying algebraic expressions was concatenation as Welder (2012) illustrated. For example,  $39x - 4$  was concatenated quite often by students into  $35x$  and  $2yz - 2y$  concatenated into  $z$ . Carry, Lewis, and Bernard (1980) confirmed that such kind of error occurred not only by beginning algebra students but college students as well. In their study, such error was the most predominant one that students made during their simplifying expressions at different stages of equation solving. Furthermore, they indicated that such error could be caused by students' over generalizing certain validated operations to achieve a generic operation. Thus, the arbitrary strategies and concatenation approaches are the typical behaviours that students demonstrate in the simplification expressions.

## 5.3. Equality

Equality is one of the requirements for generating and sufficiently interpreting structural representations such as equation (Kieran, 1992). It is normally referred to as the left-right equivalent of the equal sign. However, it is shown from researches that the equal sign is too often misinterpreted by students at all levels of education although high school and college students could be more willing to accept the equal sign as formal symbol for equivalence than younger students as Welder (2012) commented.

Behr, Erlwanger and Nichols (1980) revealed that beginning algebra students took the equal sign as a procedural indicator. For example, students were reluctant to accept expressions such as  $3 + 4 = 2 + 5$  or  $3 = 3$ . They would like to change equality  $3 + 4 = 2 + 5$  to be separated into two equalities  $3 + 4 = 7$  and  $2 + 5 = 7$ ; equality  $3 + 0 = 3$  (Welder, 2012) in terms that they would think that the right side should be the answer.

In addition, Falkner, Levi, and Carpenter (1999) further offered specific data for such limited interpretation of the equal sign. In their investigation, all the participations (145 American students from grade 6) could not correctly fill the number sentence  $8 + 4 = \_\_ + 5$ . The typical answer for this question was 12 or 17. In addition, the similar situation was presented in the analysis from Li, Ding, Capraro and Capraro (2008). It was evidenced that there were only 25 out of 105 American Grade 6 students could correctly fill the first blank in such number sentence  $3 + \_\_ = 4 + 4 = \_\_$ . However, 91 out of 105 students could give a correct answer 8 for the second blank.

In a word, the misunderstanding and ill operation of equal sign impede students from access to the concept of equity which is the core component of the concept of equation in algebra learning.

## 5.4. Word Problems

Word problems are regarded as stumbling blocks in algebra to access to higher mathematics, even leading students to drop out of mathematics (Cai et al., 2004). The formal approach used in word problem solving is to formulate an equation or system of equations and operations (Kieran, 1992). However, the students' prior arithmetical experiences posed a great influence on their word problem in secondary.

Khng and Lee (2009) reviewed on the influence of secondary students' prior arithmetical experiences on their word problem solving in Singapore. They commented that algebra word problems were taught in primary school with arithmetic methods, such as counting techniques, guess and test, working backwards, and grouping and model method. And students were very proficient with these methods and regard them as prepotent strategies. Consequently, given the accruing prepotent strategies from primary mathematics, students thought firstly about these strategies rather than algebraic equation formulation when they were presented with word problems in secondary school.

In addition, secondary school teachers often find that beginning algebra students are not motivated to learn the skills needed to solve algebra word problems (Ng & Lee, 2009). This is partly due to the fact that, with the affordance of a concrete and visual representation for the unknowns and arithmetic procedures to solve for the unknowns, students can avoid engaging with the representational and transformational activities, generalising and justifying activities, activities which students find challenging (Kilpatrick, Swafford, & Findell, 2001).

Except for the influence from the arithmetic thinking, students have difficulties in formulating an equation or equations system for a word problem. Reed (1987) found that students had difficulties in recognizing and generating the similar structure among problems with different context. Students often resort to different approaches to access the relations or structures involved in a word problems. For example, syntactic translation and substitution of various numbers are used to verify the adequacy of the equations (Reed, Dempster, & Ettinger, 1985). Tables of relations are also found to be used by students to generate equations for problems; however, representing correct is quite challenging for students (Hoz & Harel, 1989). Moreover, from the cognitive perspective, it is evidenced that students have considerable difficulty in specifying relations among variables (Chaiklin, 1989).

Equation solving is another barrier for students' word problem solving even though they could formulate a correct equation. Students have generally been found to lack the capability to generate and maintain a holistic overview of the structures of an equation, which impacted on the next algebraic transformation to be carried out (Kieran, 1992). For the multi-operation equations, it is noted that students often make very poor strategic decisions in simplifying algebraic expressions and operations (Carry, Lewis, & Bernard, 1980).

Word problem solving is the application field of students' algebraic knowledge including building the relationships between quantities, expressing the relationships by equations, and solving equation. If students get stuck at any one out of the three stages, the word problems would not be solved proficiently.

From the above mentioned discussion on the learning matters, it could be seen that there is much attention paid to the students' specific challenges in certain topics of algebra learning. The challenges' explosion could be incurred by all the categories already discussed such as algebra content, cognitive gap, and teaching issues. Thus, the discussed learning matters are consequential phenomena caused by the structural nature of algebra, cognitive gap, and the absence of teaching concerns.

## 6. Transition Knowledge

There are two kinds of knowledge emerging from the literature to address the knowledge required in the transition from arithmetic to algebra: adaptation to a milieu and social interactions; and the adjustments.

### 6.1. Adaptation to a Milieu and Social Interaction

Sadovsky and Sessa (2005) aimed to give an account of the emergence of knowledge pertaining to the transition from arithmetic to algebra in the course of an algebra learning classroom with two kinds of interaction such as the didactic interaction between each student and a given problem, and the didactic interaction of each student with the procedures of others. It was assumed by them that the processes of adaptation to a milieu and the social interaction were crucial for the transition from arithmetic to algebra.

### 6.2. Adjustments

Kilpatrick, Swafford, & Findell (2001) revealed that students needed to make many adjustments in the transition from arithmetic to algebra even for excellent students in arithmetic. The assumption was supported by many examples provided by their analysis. For example, an adjustment from answers orientation to relations orientation was illustrated from the following statement "elementary school arithmetic tends to be heavily answer-oriented and does not focus on the representation of relations" (p. 261). A specific example provided by them



was that students always assumed  $8+5$  as a computing signal and typically wrote 13 for the number sentence  $8+5 = \_\_+9$  by evaluating it instead of the correct answer 4. Another adjustment from undoing operation to expressing equation was exemplified by a problem solving “when 3 is added to 5 times a certain number, the sum is 38; find the number” (p. 262). The arithmetic method is undoing in reverse order (subtract 3 from 38 and then divide by 5), while algebraic way is to represent the relationships by the stated operation:  $5x+3=38$ . Therefore, the different methods require the students to make certain adjustments.

Based on the idea of adjustments, Kieran (2004: pp. 140-141) defined five kinds of adjustments: 1) a focus on relations and not merely on the calculation of a numerical answer; 2) a focus on operations as well as their inverses, and on the related idea of doing/undoing; 3) a focus on both representing and solving a problem rather than on merely solving it; 4) a focus on both numbers and letters, rather than on numbers alone including: working with letters that may at times be unknowns, variables, or parameters; accepting unclosed literal expressions as responses; comparing expressions for equivalence based on properties rather than on numerical evaluation; and 5) a refocusing of the meaning of the equal sign. The five adjustments are not only the knowledge we should know about students’ transition from arithmetic to algebra but also the guidance for teaching to prevent or treat students’ difficulties in algebra learning.

In fact, the transition knowledge generated from the literature is taken as the systemization of main challenges students might encounter and the suggestions of overcoming their difficulties in the algebra learning. Therefore, the knowledge is also regarded as a remedy for the scarcity of teaching orientation.

## 7. Conclusions

In this literature review, it is attempted to re-conceptualize much of the existing algebra researches by focusing on the challenges that students might confront with in learning algebra from the perspectives of algebra content, cognitive gap, teaching issues, learning matters, and transition knowledge. The perspectives adopted in this paper could serve as a framework of better understanding students’ difficulties in their algebra learning.

In addition, from the critical perspective of reviewing the existing researches, it could be found that the existing researches are conducted from the static angle to examine the causes resulting in students’ difficulties in algebra learning. In another word, there is a lack of process analysis of students’ going through the transition from arithmetic to algebra. Without the undoing of the process, we could not perceive the circumstances that the students could struggle with so well that we could not provide apt strategies to prevent or remedy the difficulties (Wang, 2014: p. 2) in a systemic way even though we know the existing difficulties and their causes.

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# Perception of Growth Condition in the University from the Perspective of Freshmen Students

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## Abstract

This study aims to analyze and assess the perceptions that freshmen students recent graduating from high school have towards their adaptation in college, as well as comprehending how this process of transition from high school to college occurs. Thus, a qualitative study was conducted, using semi-structured interviews. Eight students from a public college institution in Brazil participated in this study. Analysis of Content was used in order to analyze the data, which were grouped into semantic categories. The results show that the aspects related to teaching, didacticism and relationship with professors are important to the adaptation process and these three aspects are from interdependent categories. Although the insertion in a different environment was potentially adverse, the students cope this reality as an opportunity for personal growth. Regarding to the perception of the growth condition, the results show that the participants focused in extracurricular and curricular activities offered by the University and not in the affirmative policies.

## Keywords

Academic Transition, College Life, Growth Condition, High School

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## 1. Introduction

A significant growth of the number of students getting into college is being perceived in several universities

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throughout the world (Teixeira, Castro, & Piccolo, 2007; Almeida & Cruz, 2010). In Brazil, the expansion of higher education has been a reality and it is a result of policies that are being developed in the country. For example, basing upon data from the Brazilian Ministry of Education, Machado (2009) reports that in just six years (2003 to 2009) the number of admissions to college would go from 113 thousand to 227 thousand. Besides this, there are two other programs that have helped with the growth of the number of admission, known by *Program for Restructuring and Expansion Support*, and *University for All People* has offered thousands of full-tuition scholarships in private schools.

At the same time, the number of studies about academic failure due to low grades, absenteeism, changes of courses and dropping out are increasing (Almeida, Soares, & Ferreira, 2000; Igue, Bariani, & Milanese, 2008). Therefore, the first academic year in college has been pointed in the perusal as a critical period to define the permanence of the students in college, because it involves a process of transition and adaptation to a completely different reality from what is observed in high school (Almeida, 2002; Almeida, Soares, Guisande, & Paisana, 2007).

The academic transition occurs when the presence or the absenteeism of certain event results in changes in the routine, in personal and social life, as well as changes in the social role the individual plays, which may affect the way a person perceives themselves and the world. Getting into college is an unique process of transition, for it coincides with developmental changes that belong to the transition from youth to adulthood (Teixeira et al., 2008).

Otherwise, the professional choice seems to be in the background for the sheer fact that after getting admitted for a post-secondary institution, the young adult perceives himself as a college student (Teixeira et al., 2008). Getting into college, therefore, brings an impact beyond professionalization, for, to many people, this new context brings the needs to, for the first time, perceive themselves in a reflective social status, establishing personal goals, critically analyzing their abilities and skills, performance and social background.

The insertion in the university context will result, necessarily, in a change in the social and friendship circle, and, for some people, there maybe even the needs to move to other places or cities to attend college (Teixeira, Castro, & Piccolo, 2007). Almeida and Cruz (2010) single out that freshmen students have to deal with an unknown context and, sometimes, this new context may be slightly integrative. With this, the student has to manage, more autonomously, their financial expenses, time for studying, career and the time spent with friends (Almeida, 2007; Ferreira, Almeida, & Soares, 2001; Soares, 2003; Taveira, 2002). In this way, the majority of the difficulties of the process of transition and academic adaptation are related to the fact that the students in their first year of college have to use cognitive efforts to cope with the situations presented by the new academic context.

Those students who can perform an academic and social integration in the first few semesters of the course, probably will find it easier to grow personally and intellectually, and seize with efficacy the opportunities offered by the university. Impasses faced by students can be constituted as a catalyst for the development of coping strategies and problem-solving skills that will be useful not only for the years of graduation but also for the professional environment in the future (Teixeira et al., 2008).

Thus, this study aims to assess the transition experienced by the student when leaving high school to get into college, as well as analyzing the meaning of being a college student. To achieve the overall objective, the following specific objectives were set:

- Analyze high school and university contexts;
- Identify the differences between high school and college;
- Analyze the impact of the differences between high school and university towards the student's adaptation;
- Identify and analyze growth conditions in the university in the perspective of the student that just graduated from high school.

Public higher education in Brazil and in the state of Bahia has passed through an expansion in the last five years, which has resulted in continued growth of admissions, number of majors, new teaching units and the implementation of affirmative policies in this context. Facing the changes in post-secondary schools in Brazil, a study is crucial to understand the phenomenon presented. Considering this, this paper seeks to fill a gap in the literature, for there is still lack of studies that aim to analyze this current reality of higher education, as well as the conditions of new students, being them university entrants recent graduated from high school.

Thus, this paper contributes to understanding this process by providing data that demonstrates how the process of adapting to the college environment has occurred, especially in the Brazilian context, as well as con-

tributing to identifying what are the obstacles faced towards achieving a successful transition between high school and university considering the changes related to the developmental age of the students. This study also seeks to provide information to the development of policies that can be implemented by the academic institutions, aiming to give more support to freshmen students and their psychosocial well-being.

## 2. Method

The study was conducted from a qualitative method of collecting and analyzing data since this method is valid to understand the phenomenon studied. Thus, the subjects involved had the opportunity to report characteristics of their personal experience to the topic discussed.

### 2.1. Instrument

An interview was conducted in this research and its content are based upon the Experience and Academic Transition Questionnaire (QETA) developed in Portugal by [Azevedo and Faria \(2003\)](#), which consists of 28 items that are distributed in five dimensions—Teachers, Family, Social Relation, Course Organization, Syllabus. Thus, 12 questions were developed based on these dimensions proposed by QETA to meet the objectives pursued in this investigation.

The questions aimed to: 1) investigate the process of transition and adaptation by questioning the expectations upon college; 2) analyze the first impressions perceived after enrolling at the university; 3) collect data about the factors that facilitated or interfered the adaptation; 4) study perceived differences between the realities of high school and university; 5) point out the perception of growth conditions offered by the university; 6) identify possible personal changes, elapsed when getting into university, and 7) verify the expectations for the following years of graduation.

In this article we will explore the contents obtained with the questions which emphasized the factors related to the transition and adaptation process and also the growing conditions from the perspective of incoming students.

### 2.2. Participants

The study included a total of eight people between 18 and 23 years old from different majors (Dentistry, Social Sciences, History, Nursing, Executive Secretary, Economic Sciences, Chemical Engineering and Design) attending the initial semesters of their respective courses at a federal public institution of education. The students graduated from both public and private high schools—5 females and 3 males. We sought the widest possible variety of courses because it was assumed that these courses offer different realities within the university both in terms of infrastructure units as the specificities of the course and its organization.

### 2.3. Data Collection

The interviews were conducted in units of the university, where students were approached and asked about what semester they were attending and the gap time in between graduating from high school and getting into college. The subjects of the study were those who agreed to participate, who were attending the initial semesters of their respective courses and who entered the university in a relatively short time after completing high school. Students that did not get into college at least until twelve months after graduating from high school were not able to be considered in the sample, for longer time in between graduating and getting into college might influence the transition and the way students cope the obstacles, since they are older and might have passed through other activities as getting a job or taking other courses. Individual interviews were held in a single session that lasted on average 20 minutes. After the consent of the participants, the interviews were recorded and later transcribed and grouped into semantic categories. Data were grouped into categories and subcategories defined from the participants' speech and divided into two large blocks of analysis defined in this research objectives.

The content analysis technique was used with the data obtained in this study. This technique aims the study and analysis of the communication in an objective, systematic and quantitative way, says Martins (2006). The information about the questions that guide this research problem were singled out as they would appear in the speeches of the students. The author mentioned above approaches that the essence is emphasized in the context of details of the information available, focusing not only on the text, but mainly on the way the word is used. Therefore, the content analysis is not restricted to the description of the contents revealed in the interview, but on the total showed in the communication, seeking to understand about the causes and backgrounds of the mes-

sage, as well as the effects reported by the interviewees.

The authors Dellagnelo and Silva (2005) and Martin (2006) showed, in a similar form, three stages or times of content analysis. Initially, the pre-analysis, which corresponds to collecting, organizing the material and defining the procedures to be followed. Then, there is the material exploration phase, involving the analytical description, with the implementation of procedures: counting words or other units of analysis, survey categories already tested or construction of categories from the frequencies and common meanings of the units of analysis. The categorization includes the inventory of units of words' analysis, themes, phrases and the classification of common units revealing the categories. The third step constitutes of the processing of data, which involves generating inferences and interpretations about the text in general.

### 3. Results

The data presented below correspond to the two large blocks of predefined analysis for this study: *High School* versus *University* and *Growth Conditions*. The answers of the respondents were grouped into semantic categories and then into subcategories, since the same general theme was approached from different perspectives.

The first block of analysis and discussion, *High School* versus *University*, is related to any comparison, reported by the interviewees, between their experience in college and in high school. The purpose of this was to map the main differences and/or similarities perceived between these two realities. Six categories were defined for this block, presented below in **Table 1**.

It is possible to observe that the category that had more quantity of content and mentions (14) is *University Context* and the second category is *Content*, with 7 mentions.

The second block of analysis and discussion, *Growth Conditions*, is related to the opportunities students perceived as conditions for growth offered by the university. **Table 2** shows all the categories and subcategories and the answers related to them, as mentioned by the participants in the research.

**Table 1.** Differences in between high school and university.

<b>High School versus University</b>			
Categories	Subcategories	Frequency (by Subcategory)	Total Frequency (by Category)
University Context	Autonomy	4	14
	Demand	3	
	Insertion on a Heterogeneous Social Environment	4	
	Workload	3	
Content	Objective	4	7
	Reflective	3	
Didacticism	Different Teaching Methods	6	6
Relation Professor - Student	Affective Bonding	1	5
	Relation of Authority	2	
	Relation of Independence	2	
Activities Offered	Diversity	1	1
Psychal Structure	Adequacy	1	1

Elaborated by the authors.

**Table 2.** Summary of the affirmative policies and opportunities offered.

<b>Growth Conditions</b>			
Category	Subcategory	Frequency (by Subcategory)	Total Frequency (by Category)
Affirmative policies	Knowledge about the Offers	1	2
	Perceived Failure	1	
Opportunities	Extracurricular	4	12
	Belonging to the Syllabus	4	
	Personal Growth	1	
	Professional Network	1	
	Limited	2	

Elaborated by the authors.



## 4. Discussion

### 4.1. High School versus University

#### 4.1.1. University Context

The first category, *University Context*, was created from the answers that indicate particular characteristics about the university environment. In general, all the speeches of the participants regard to this issue pointed to the effects of the university context on personal studies and on their personal lives. Among the subcategories, we have: *Autonomy*, *Demand*, *Insertion on a Heterogeneous Social Environment* and *Workload*.

The subcategory *Autonomy* is directly associated with the structure of the university in comparison to high school. Students report that, in the university, there is less regulation related to teaching and learning process, that is, being loose and having weak norms for behavior; the university was reported also as an institution that directs the responsibility for learning to the individual rather than the institution, as it is perceived for the high school context. The university, therefore, represents a rupture with the model seen in the secondary education, an issue pointed by Teixeira et al. (2008): the interest in monitoring decrease at the university, so that the responsibility for learning, which previously belonged to the school, is now expected to be managed by the college student.

Soares Almeida Diniz and Guisande (2006) highlight that the student is responsible for their own autonomy in the learning process and in the organization of their time and methods of study, remarked by a participant: “(...) in college you are very free to do what you want. Nobody reminds you to study. You are the one who sets your goals and demands.”

In a way, this change is perceived positively, as they realize themselves with autonomy, possibility of growth and of establishing their own rules and choices. At the same time, freshmen students seem to face more pressure about having to take care of themselves, to take responsibility. This, therefore, usually represents a source of anxiety.

The content related to the category *Demand* is related to the level of difficulty that the university offers. This aspect is strongly related to the academic domain, defined by Almeida and Soares (2000), which relates to the imposition of new rhythms and learning strategies due to changes in the ways of teaching and assessment. And also it highlights the need for new students to adapt to the new system of teaching and assessment, which requires higher levels of cognitive efforts and abilities (Soares, Poubel, & Mello, 2009).

Some respondents confirmed that the university seems more demanding and harder than high school, especially when related to the quantity of subjects to study and to the exams and tests. This difference influences on how the student deals with studies and time, since this change requires an adaptation to the demand and more time dedicated to academic aspects.

The subcategory *Insertion in a Heterogeneous Social Environment* is related to the meaning of entering into an institution with a substantial structure, both physically and diversity. Teixeira et al. (2008) point that the majority of freshmen students describe high school as the place where they would spend most part of their time, where their life would get organized and where they had most part of their friends. Given this, it is comprehensible that the university context presents itself so differently from secondary education, which was pointed as a strict and limited environment.

While for some people getting into a new place seems challenging, for other people this change can be coped as an opportunity to broad their perception of the world and personal growth. Regarding this aspect, a participant reports: “(...) [the university] helped me, you know... to get out of a little box I was in... it helped me to know other things”.

The subcategory *Workload* is about the organization of the class prepared by the majors in the university in comparison to high school. It was noticed that students have a perception that the university consumes much more time, demanding that they reorganize their studies, their inclusion in extra-academic activities and their personal life.

#### 4.1.2. Content

The second category, *Content*, gathers contents that highlight the perception of the students in reference to the type of the content learned and how it is passed to the students in high school and in college. Thus, from this category, two subcategories are given: *Objective* and *Reflexive*.

The subcategory *Objective* refers to the type of knowledge and its transmission in high school compared to

college. Students understand that the main goal of the secondary education is to convey the contents, that were set by the institution, get good grades and pass the year without necessarily worrying about the personal human development.

Closely linked to the subcategory mentioned above is the subcategory *Reflective*, remarked, including, by the same person in addition to the information already reported in the interview. In this category, however, the focus of the speeches is on the perception that students have about the content of university education. Unlike high school, the content to be learned in college requires the student a higher level of reflection, and even encourages the student to think for himself and make questions, creating a space for the student to form and share and respect critical opinions.

In this sense, Almeida and Cruz (2010) corroborate this perception of students as they consider the teaching and learning environment at the university a very different reality of the one encountered in secondary school. Besides the fact that the university is considered an environment where there is not a strict standard of rules dictating the pace of discipline and classes, as in high school, there is more interest in developing skills in college students.

At the same time, it was noticed that the learning process at university goes beyond its environment since it focus on professional and personal development (Coulon, 2008). The education thus comes to incorporate a meaning for the students, as they begin to observe that this is a necessary knowledge for life, for their professional future, much more observed in college than in high school, where the knowledge is more objective.

#### 4.1.3. Didacticism

The way the content is transmitted to the students is directly related to the content itself—a practical content is likely taught in a practical way, and an objective subject is likely taught in objective ways. Therefore, the *Didacticism* category approaches those contents which make reference to the comparison between the way knowledge is conveyed by instructors in high school and university. The students tend to value the degrees accomplished by their professors, and consider this aspect a moderating factor that affects the quality of the teaching. The amount of years of education of high school teachers in comparison to the university professors seems to reflect the perception of students regarding the attitudes of professionals in the classroom and the quality of teaching in both contexts. This student says:

In high school the teacher is there, not very much committed. We even notice that the school does not have an adequate teaching. But is not like that in the university. Because it is a federal university, its name is known. We have masters and PhD's professors [...]. But in high school we don't have anything like that.

Another student, on another hand, provides different information, reporting how demanding high school was for his graduation:

[...] everything was very different because in high school everything is more tiring for the student, it is stressful, and at least in the period that I was studying in secondary education and in high school I had wanted everything to go away as fast as possible. I wanted to get rid of it and get done with my studies.

The complaints towards the didacticism can be strongly associated with the characteristics mentioned above, that the knowledge transmitted in high school is much more objective, with little proximity with reality, strict and strongly requires memorizing subjects for the exams rather than learning and practicing (Almeida & Cruz, 2010).

#### 4.1.4. Relation Professor-Student

The fourth category *Relation Professor - Student* covers the relationship between professor and student in secondary and postsecondary education. Three subcategories were created: *Affective Bonding*, *Relation of Authority* and *Relation of Independence*.

*Affective Bonding* refers to the distance or the proximity in the relations in between professor and student, compared to high school. At the university is possible to notice, from the answers of the students, that the relationships look much more resistant. A student says: "I think you do not have a strong relationship with your professors and your colleagues. It is much more difficult to make friends".

The high school environment seems to help with affective bonding, both with the peers and with the teachers, for there is a possibility of having the same colleagues around for years; regarding to the teachers in high school,

they are used to teach to the same group of students for at least a year, and they see the students regularly during the week. This fact can help understand why the student above mentioned that is harder to make friends and have bonds with the professors while at university, since classes are different each semester, the students usually take different classes during the graduation and there is heterogeneity of personalities grouped in the same class.

In fact, [Teixeira et al. \(2008\)](#) point out that certain authors (Diniz & Almeida, 2006; Pascarella & Terenzini, 2005) highlight being vital a satisfactory social integration in the new context for a better adjustment to university. Given this, it is important to consider that relational issues appear as influencers on the students' adaptation to the university.

The *Relation of Authority* was perceived only in high school, since the respondents reported that this environment strongly reinforce the role of the teacher as a hierarchical authority holder before the students. Certain participant pointed out: "the issue of the teacher with the student: the teacher always knows you're only there to learn what he says and period... That thing, the teacher talks and the students have to obey, that punitive thing".

It is observed that this category is directly related to the previously analyzed on the objective and reflexive contents. For, the knowledge that is needed to be taught influences the way it is going to be conveyed to the students. The fact of conveying a knowledge that is objective, is strongly connected with the idea that the teacher has knowledge, that he is in charge to teach and the students are in charge to learn; the relationship is well defined and marked, being designated that the student has the passive role of obedience and expectador.

In contrast to this, the knowledge learned at university, having more reflective aspects, often involves the participation of the students, demanding that they opine and reflect on what is said. Also, that way, the students are more likely to increase their academic goals and their knowledge during graduation, thus altering its relationship with the studies, consequently, with the professor who also helps with information and advices to students achieve their goals.

The *Relation of Independence* brings another perspective about the relationship student-professor. For the participants that mentioned this content, the teacher in high school is seen as a professional that possess a directive role, assisting students more closely, what generates a relevant reliance on students to their instructors; this perception is associated with the idea that the teacher assumes a motherly/fatherly role, and that they usually facilitate to the student. One participant points out this issue as follows:

For example, when we're in high school [there is a need for the teacher to] help you, [...], is like a father and a mother, but not here, where is totally different. The [university] makes you seek more things by yourself, it's totally different.

It is noteworthy that this perspective was brought by students that attended their secondary school at a private school. About the university, the professors assume another role in the relationship, acting more as facilitators, promoting independence and enabling the student to experience more autonomy.

#### 4.1.5. Activities Offered

The category *Activities offered* refers to the diversity of activities that can be developed and offered by the university, compared to those offered in high school. For the students, high school has limited opportunities, which restricts the potential of the students; On the other hand, the possibility of engaging in diversified projects during their college graduation is viewed positively since it contributes to the perception of adjustment and professional growth for the participants.

#### 4.1.6. Physical Structure

The category *Physical Structure* refers to a comparison of the psychical space in the university and the school contexts. One student, from a public school, ponders that the physical space in a school is becoming less welcoming, and, somehow, even repulsive; this contrasts with their perception of the university, ample space that is open and accessible even in times when there is not class to attend. The student has the opportunity to attend university even in their free time, which allows them a better use of this space (library, computer lab etc).

### 4.2. Growth Conditions

This topic was elaborated in order to identify in the answers of the students what is seen as a growth opportunity offered by the university. Two categories were configured: *Affirmative Policies* and *Opportunities*.

It is important to mention the lack of studies regarding the influence of growth condition offered by universities, what is possibly related to the recent federal affirmative policies implementation in the Brazilian educational system.

#### 4.2.1. Affirmative Policies

The category *Affirmative Policies* was defined from two opposite categories, one refers to the *Knowledge about the Offers* and the other one about *Perceived Failure*. Two people mentioned this category, and it is divided in terms of offering affirmative policies or lack of this offering. The student reports that he does not know about offers of affirmative policies. He says:

I felt difficulty because we don't have, for example, financial aid, and if we have nobody has informed me. We don't have support on printing out papers, and other institutions do. I didn't know we didn't have this support, then I felt difficulty about it.

It is important to mention, though, that although the student does not know about the affirmative policies, it does not mean that these do not exist. On another hand, may indicate the need for greater disclosure and dissemination of this information by the university.

#### 4.2.2. Opportunities

The aim of the category *Opportunities* was to gather all the answers that demonstrates what type of policies are perceived as growth conditions by the college students. The answers approach five subcategories: *Extracurricular*, *Belonging to the Syllabus*, *Professional Network*, *Personal Growth* and *Limited*.

The *Extracurricular* subcategory covers the answers that are related to complementary activities offered by the institution. These activities are not mandatory, and are perceived as important in order for the student to develop skills and abilities for their own professional growth on a specific field. Among those cited, there are: opportunities of studying abroad, Science without Borders program, scholarships for scientific research and extension projects.

In this sense, the literature has pointed out the importance of extracurricular activities to integrate the student into the university environment. For, as [Teixeira et al. \(2008\)](#) remark, non-mandatory academic activities enable contact with other professors and students, moreover, more time dedicated to these activities encourages academic involvement and responsibility for an activity that was chosen optionally.

The subcategory *Belonging to the Syllabus* covers the answers that mention, specially, material and theoretical material, offered mandatorily by the post-secondary education institution. Theoretical resources are the knowledge and are the basis for professional practices, as it is shown as follows: "The theory that is being applied sometimes is not even from my course, but they put the class in the Syllabus so that it can help the students understand the society and how I should act as a professional".

Material resources are the equipment that the university provides in order for the student to experience practical contents required for the graduation. It is noteworthy that the student who mentioned this issue studies Chemical Engineer, and, for this course, the materials are indispensable for the acquisition of knowledge required in professional practice. The student who addressed this issue says: "All the equipment we need—because Chemical Engineer requires the usage of computer, simulation, several programs for several types of substances—we have: several computer labs already with the programs installed".

Another subcategory mentioned by one participant is related to the *Personal Growth*. The person answered that even when the resources offered by the university are flawed, the fact of having to adapt themselves in order to find a creative alternative helps the students grow as a person, enabling them to handle adverse situations.

Thus, these data corroborate the results found by [Pachane \(2003\)](#), which shows that students excel the expectations about the university—they usually expect to seek in the university professional training, qualification and achievement as well as personal growth. Thus, the student expects of the university all the support, preparation and professionalization and opportunity to grow as persons.

In the subcategory *Professional Network* was allocated the content remarked by a student who singles out the university as an environment useful for future employment contacts, because there is the possibility to know and to contact references in the area that, somehow, can contribute and facilitate the student's insertion in work organization. This aspect is evidenced in the following statement: "The network provided by the university is very important for contributing for future opportunities in your field of study."

The *Limited* subcategory refers to the image students have that the university has gaps in some aspects that would contribute to the growth of the student. An interviewee points out the need to seek extracurricular courses to fill the gaps imposed by the lack of structure of the university may hinder the student's growth and learning. A student says: "For lack of structure means lack of access, this access is our right and lacking of access inhibits our learning process, forcing us to take extra courses, for example".

For another participant, the university should promote more integration with the surrounding environment, with outdoor classes. This issue is shown as follows:

"As here is a historic place (...), we could explore this place to have class, get outdoors, and have a closer contact to people. We should step out a bit of academic subjects, or of the restriction of having to read textbook, papers. I think we should go to outdoor places more often."

The data analyzed show that, for the participants, the aspects between high school and university with more relevance are associated to the changes in context, that reflect on personal issues such as autonomy and as the way the world is perceived. Also, it is possible to observe that the results show as important the aspects associated with the type of knowledge disseminated in both contexts and how they are transmitted, and in comparison to the contexts the answers attribute to university a better status than in high school.

Otherwise, regarding to the growth condition, it can be observed that the students barely mentioned the affirmative policies in the university context, being more highlighted the aspects related to curricular and extracurricular activities offered by the institution. This may indicate a lack of knowledge about the existence of aid and resource offered to the students, probably due to failures in the process of informing the students.

From the description and analysis of the data, we can conclude that the most relevant aspects in comparison between high school and university are regarding the *University Context* (14) *Content* (7) *Didacticism* (6) and *Relation Professor - Student* (5). It is noteworthy, therefore, that all these categories have elements in common, especially in regard to the knowledge conveyed and required in both realities: high school content is objective and theoretical, and in the university, a reflective and practical knowledge institution, associated with the professional's graduation, therefore more significant for the subject.

At the same time, the perception of students is directly related to the attitude of the teacher/professor in the classroom and, consequently, the results show that teaching didacticism at school is more authoritarian and punitive, and the students have to obey usually. Due to this directive aspect from the teacher and the subject, the student is more likely to be dependent and restricted about seeking knowledge for personal purposes. On the other hand, in the university, the professor takes over the role of facilitator, valuing the encouragement of reflection, thinking, turning to the students the responsibility for their learning process and giving them the environment to be more autonomous; it requires more dedication to studies and management of other aspects of life, whether academic or personal.

Autonomy is promoted not only by the professor but by the university context in itself. The fact that the environment is broad invites the students to be the protagonists of their graduation process and also their personal growth, as they learn to cope with new demands and to conduct the management of adverse situations and the involvement in mature interpersonal relationships.

At the same time, it is observed that the perception of growth conditions is far distant from the affirmative policies. For the participants, these conditions would be offered by the university in both curricular and extracurricular aspects. In the curricular aspect, the interviewees highlight the level of excellence about the teaching at the university, the fact that the institution provides a theoretical apparatus that enables them to be professionals in their respective areas. Also, they consider growing conditions to be related to extracurricular activities such as research, monitoring, extension, etc.

## 5. Conclusions

In general, it can be observed, among the participant group, a positive perception of the university towards the fact that this is not only enabling professional growth, but also growth in the personal level, for the adversity and variety of context have generated an expansion of perception and apprehension of the world. However, it should not be disregarded that the students barely mentioned the affirmative policies offered by the institution, probably because of lack of information and support for the freshmen students. The university environment was, at first, considered potentially threatening for the college students; however, the subjects showed no signs of maladjustment, but positive expectations for the incoming years of graduation.



This study contributes with information about the academic context and with a discussion of a thematic that has a relevant international repercussion, but is still incipient in the national literature.

Thus, it allows an overview on the specificities experienced by students that just left high school and entered to the university environment in relation to their transition and adaptation processes, allowing to research possible difficulties and needs that may contribute to the student's adaptation, such as institutional policies.

As limitation to this study, we consider the number of eight participants a small size sample. Although this factor, this study shows evidences of a qualitative research and shows analysis about the phenomenon from the speeches of the students, which is the goal of a qualitative study; we propose that other studies research the transition to college for recent high school graduates in order to corroborate and compare to the findings of this paper. Also, for future research, we suggest that studies approach emphatically the aspects of the growth conditions offered by the university, the perception of the offers and how the students have access to information about the opportunities. Also, we suggest that quantitative studies address the issue more broadly in an institution of higher education, allowing a general look at the transition and adaptation of recent high school graduates attending their first year of college.

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# A Systematic Review of Literatures on Factors Associated with Educational and Academic Performance in Attention Deficit Hyperactivity Disorder

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## Abstract

Attention Deficit Hyperactivity Disorder (ADHD) has been shown to impair major life activities including educational functioning. However, there is no consensus on the specific cause for the impact on this worse educational outcome. This systematic review aims to identify factors that have been associated with educational and academic underperformance of children and adolescents with ADHD. A literature search was conducted using PubMed and the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The study focused on articles presenting results of data-based analyses related to ADHD and keywords related to education. The search resulted in 376 records that were screened by title. Of these, 185 articles were screened by abstract and 35 met the eligibility criteria for inclusion in the review. These 35 articles were related to seven domains: educational training, educational environment, pharmacological treatment, ADHD symptoms, associations of ADHD with academic outcomes, self-concept, and specific skills. The main source of educational challenges seems to be related to the inattentive symptoms (or subtype) of ADHD. This outcome is different than expected, since hyperactive symptoms are pronounced more prominently and often refer children to clinical practice. Inattentive symptoms amongst others refer to difficulties in organization skills and can lead to decreased self-efficacy and development of depressive symptoms. This decreased self-efficacy and the depressive symptoms were also found to be related to influence the relation between ADHD and academic perfor-

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mance. Educational outcomes were shown to be improved using small group work, learning via a computer-based service and as a result of coaching and pharmacological treatment. To help children and adults achieve educational goals that now are out of reach, more attention should be spent to the inattentive symptoms of ADHD and possibilities to overcome experienced problems.

## Keywords

ADHD, Education, Academic Performance, PRISMA

## 1. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is the most common neuropsychiatric disorder in children and adolescents (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). The prevalence rate is similar across countries in Europe and throughout the world and is estimated at 5.3% (Polanczyk et al., 2007). Core symptoms of ADHD comprise inappropriate levels of inattention, hyperactivity and impulsivity (Goodman & Livingston, 2013). Multiple follow-up studies have been published that show ADHD persists into adolescence and adulthood in around two-thirds of the population (Faraone, Biederman, & Mick, 2006; Lara et al., 2009). Adult ADHD is estimated to have a worldwide-pooled prevalence of 4.4% (Polanczyk et al., 2007). It has been shown that ADHD impairs major areas of life, including quality of life (QoL), social relations, family functioning, and education and occupational functioning (Danckaerts et al., 2009; Nijmeijer et al., 2008; Coghill et al., 2008; van der Kolk et al., 2014).

DSM-IV criteria (Diagnostic and Statistical Manual of Mental Disorders, 4th edition) state that a diagnosis of ADHD is only confirmed if the child exhibits a number of inattentive, impulsive and hyperactive behaviors over a period of six months, which started before the age of seven, which should be present in school and at home, and which significantly impair daily functioning (American Psychiatric Association, 2000). In practice, indeed problems in school often bring the child with ADHD to clinical attention (Loe & Feldman, 2007). Numerous studies have reported on the association of ADHD and poorer grades, poorer reading and math standardized test scores, and increased grade retention (Loe & Feldman, 2007; Trampush, Miller, Newcorn, & Halperin, 2009; Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2008; DuPaul, Weyandt, O'Dell, & Varejao, 2009; Biederman et al., 2008). Also, children with ADHD are more likely to use special educational services than children without ADHD (Hakkaart-van Roijen et al., 2007). As several studies report on lower IQ (intelligence quotient) in children with ADHD compared to youth of the same age and gender without the disorder, it could be the case that IQ is related to the educational problems rather than specific ADHD symptoms (Biederman, Fried, Petty, Mahoney, & Faraone, 2012). However, even when taking IQ into account, children with ADHD showed significant educational under-attainment relative to what would have been expected on their intellectual potential (Biederman et al., 2008). Therefore, it could be the case that several factors together account for the lower average education achievements in children and adolescents with ADHD. It seems fair to conclude that there is a general consensus on a certain but not precisely defined negative impact of ADHD on school outcome. However, there is no consensus on the specific cause for this impact: is it the ADHD itself that causes the impact or are underlying factors at stake?

Given these considerations, this systematic review focuses on the following question: "Is it possible to identify factors that have been demonstrated to be associated with educational and academic performance in ADHD based on the current available evidence, and if so: which factors are those?" This research will contribute to understanding the impact of ADHD on educational and academic performance and will offer insights for studies or interventions to decrease the negative impact. To our knowledge, no other systematic review has been performed on this specific topic so far.

## 2. Methods

A literature search on English-language articles was conducted using the PubMed® (Public Medline) database (biomedical literature from MEDLINE®-Medical Literature Analysis and Retrieval System Online, life science journals, and online books) to gain insight in the association of ADHD and educational and academic perfor-

mance. The search was focused on articles published in PubMed from January 2000 till the final search that was conducted on October 13th 2014.

## 2.1. Guidelines Systematic Review

Assessment of the tracked records followed the PRISMA guidelines for methodology (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Moher, Liberati, Tetzlaff, & Altman, 2009). PRISMA is the most often used methodology for reporting systematic reviews, expressing the aim of standardized reporting and enhancing the clarity of systematic reviews with a generic approach (Fleming, Koletsi, & Pandis, 2014).

## 2.2. Identification and Screening

For this search, the Medical Subject Headings (MeSH<sup>®</sup>) for indexing PubMed citations were used, but no extra subheadings were selected. The key words were combined with the term “ADHD” using the PubMed Search Builder. The single MeSH term ADHD was used with selection of “Restrict to MeSH Major Topic”. The following broad terms were used and a filter was used during the search on publication date (2000 onwards), and language (English): MeSH term “education” with selection of “Restrict to MeSH Major Topic”.

Specific PubMed search:

“Attention Deficit Disorder with Hyperactivity” [Majr] AND (“Education” [Majr]) AND (“2000/01/01” [PDAT]: “2014/10/13” [PDAT]) AND (“English” [Filter]).

All search results were combined into a single master Reference Manager (RM) database. References within the master RM database were transferred to Excel and then screened independently by both AvdK and MvA based on title for the following keywords to identify articles of possible relevance: “ADHD”; “Attention Deficit Hyperactivity Disorder”; “Attention-Deficit Hyperactivity Disorder”; “Attention Deficit-Hyperactivity Disorder”; “Attention Deficit/Hyperactivity Disorder”; “Attention Deficit/Hyperactivity-Disorder”; “Attention-Deficit/HyperactivityDisorder”; accompanied with either one of the keywords:

“(Special) education(al)”; “school(ing)”; “homework”; “IQ”; “(primary/high) school”; “student(s)”; “academy”, “academic(al)”; “college”; “graduation”; “university”; “training”; “class(room)”.

Articles were then screened by abstract by two authors, again independently (AvdK and MvA). The following in- and exclusion criteria were applied: Inclusion: ADHD needed to be the major area of interest of the study, but comorbidity was not necessarily an exclusion criterion. Studies were only included if they provided data analyses. The review aimed to include explanatory articles for the relationship between ADHD and poorer educational performance. Therefore, also articles presenting outcomes of a certain class-room intervention were included, since we assumed this could provide information on beneficial factors related to ADHD and educational outcome which in turn provide information on impacting features. Articles with a focus on for example working memory and ADHD were also included, as this could provide specific information on explanatory factors for the negative impact of ADHD on school outcome. If no abstract was available, this study was included for full-text selection to be sure not to miss relevant information. Articles were excluded if the study was descriptive or an essay not containing the generation of data. Studies with the clear aim of analyzing if ADHD in fact accounts for a lower grade point average, increased school drop-out or other factual representations of worse educational outcome were excluded, since the focus of our review was on explanatory variables and not on the relationship itself. Articles describing interventions for teachers and/or parents to overcome problems related to ADHD were excluded, since we wanted to provide an answer to possible associations related to the ADHD schoolchild/student rather than the teacher or parent. Studies on abuse of medication by non-ADHD adolescents or drug-abuse by ADHD students were excluded. Articles with a focus on diagnosing ADHD in a specific setting were excluded. In this review, the snowball procedure was not applied, since the research question was not as specific as can be in a search for clinical trials, so we decided to keep the focus on the PubMed results to increase replication possibilities. Disagreement regarding eligibility was resolved through discussion and mostly by inclusion of the article for full-text review. **Table 1** provides an overview of the literature search.

## 2.3. Eligibility

Articles selected for full-text screening based on screening on title and abstract were then synthesized in a qualitative way by the two researchers (AvdK and MvA). There was no disagreement on articles selected for qualita-

**Table 1.** Table type styles Literature search.

Literature search		Selection for inclusion based on title	
<b>PubMed</b> <b>Search criteria</b> <ul style="list-style-type: none"> <li>January 1st 2000 till October 13th 2014</li> <li>English language</li> <li>MeSH terms: ADHD and Education</li> </ul>		<b>ADHD major area of interest + keyword</b> <ul style="list-style-type: none"> <li>(Special) education</li> <li>School(ing)</li> <li>Class(room)</li> <li>Homework</li> <li>IQ</li> <li>Student</li> <li>Study</li> <li>Academy</li> <li>Academic</li> <li>Training</li> <li>Primary/high school</li> <li>College</li> <li>University</li> <li>Graduation</li> </ul>	
		<b>Selection for inclusion based on abstract and eligibility phase</b>	
<b>Exclusion:</b> <ul style="list-style-type: none"> <li>ADHD was not the major area of interest</li> <li>Describing etiology of ADHD.</li> <li>Focus on diagnosing of ADHD (in a specific setting).</li> <li>Descriptive studies or essays not containing data generation.</li> <li>Only factual representations of worse educational outcome.</li> <li>General needs of students with ADHD</li> <li>Interventions for teachers to handle ADHD</li> <li>Studies on abuse of medication by non-ADHD adolescents.</li> <li>Articles describing interventions for teachers and/or parents.</li> <li>Studies on drug-abuse by ADHD students.</li> <li>Study size below n = 15 in case of one study group, n = 30 in case of two study groups, and n = 45 in case of three study groups.</li> </ul>		<b>Inclusion:</b> <ul style="list-style-type: none"> <li>ADHD as major area of interest of the study, but comorbidity was not necessarily an exclusion criterion.</li> <li>Explanatory articles for the relationship between ADHD and poorer educational performance.</li> <li>Outcomes of a certain class-room intervention were included.</li> <li>Focus on for example working memory and ADHD.</li> <li>If no abstract was available.</li> </ul>	

tive analysis. Since the validity of a systematic review has more direct practical implications, possibility for synthesis and assessment of results was based on a flowchart presented by the Finnish Institute of Occupational Health (Verbeek, Ruotsalainen, & Hoving, 2012). Based on the flowchart, results were analyzed by means of narrative synthesis, that is, describing the results as well as possible (Verbeek et al., 2012). This method was chosen, since the various study elements (especially outcome) were not similar enough in structure between the different articles to combine results. This narrative process also provides ideas for implications for future research. The narrative approach was preferred over the levels of evidence method described by the Cochrane Back Review Group and the vote counting method, since these methods are mainly based on p-values.

There was no specific focus in this review on the way the diagnosis of ADHD was stated. This was decided, since no uniformly agreed upon diagnostic tool for ADHD exists. Therefore, no clear cut-off rule could be established regarding which diagnostic tool would be deemed valid and which would be not. In general, it is assumed that a clinical interview should be part of diagnosis to be able to incorporate ADHD symptoms and their impact, but also academic and social functioning should be assessed (Kutcher et al., 2004; Buitelaar, Wilens, Zhang, Ning, & Feldman, 2009). However, five guidelines published by governmental organizations in Europe do not show consensus on the proper diagnostic process (Scottish Intercollegiate Guidelines Network (SIGN), 2009; Istituto superiore di sanita (ISS), 2009; Trimbos-instituut in opdracht van Landelijke Stuurgroep Multi-disciplinaire Richtlijontwikkeling in de GGZ, 2005; National Institute of Health and Clinical Excellence (NICE), 2008; Arbeitsgemeinschaft ADHS (AG ADHS), 2007). Therefore, we relied on the validity of the diagnosis of ADHD as stated by the authors of the included articles.

The first data extraction included country of origin, sample size, and research question. A second table was

constructed based on main findings, and conclusions for the articles included.

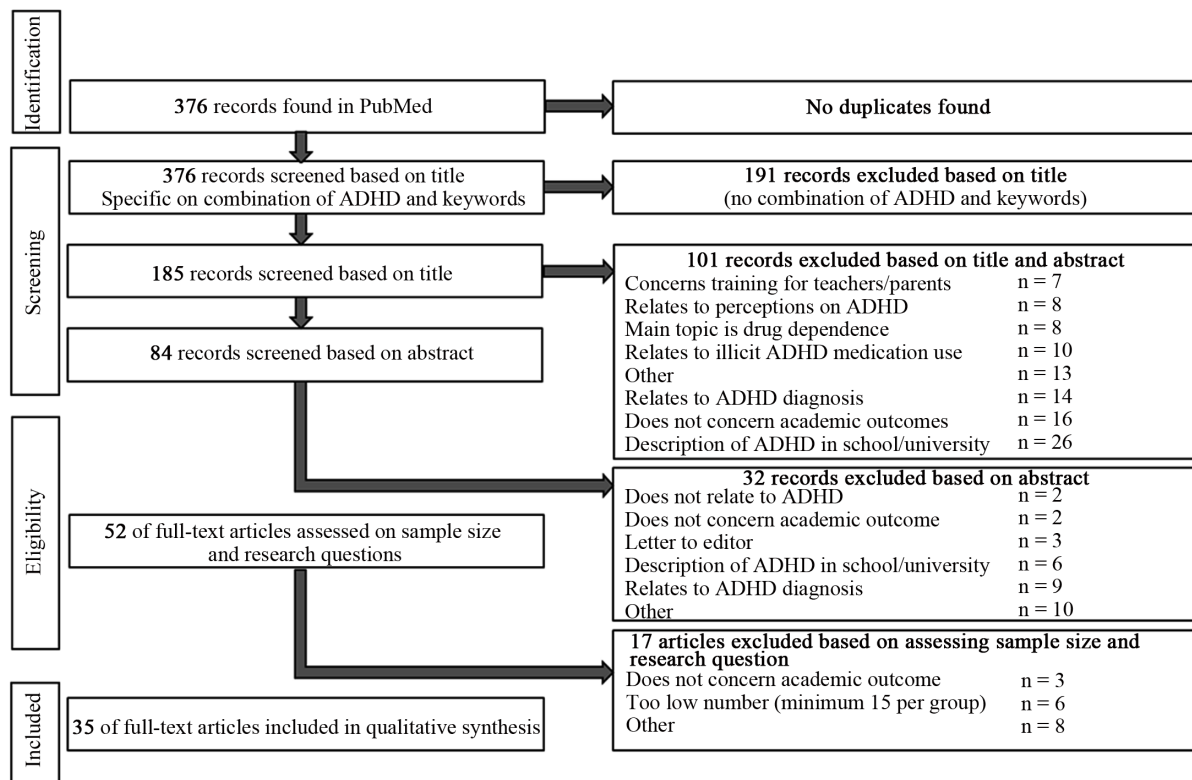
### 3. Results

The master database included 376 records, no duplicates were found. These 376 records were screened by title for relevant articles. Of these, 185 articles were screened by abstract and 35 articles were identified for inclusion in the review. **Figure 1** presents the screening process in more detail. For each of the studies included in the qualitative synthesis, **Table 2** displays the country of origin, the number of participants and the research question. **Table 3** presents the main outcomes per included study. The articles were grouped together based on their subject, these groups were not determined beforehand in order to be as inclusive as possible, but evolved based on the content of the articles eligible for inclusion. Meta-analysis was not feasible owing to the heterogeneity in outcomes reported across all study types included in the review; however, results per study type were combined and used for concluding statements.

The 35 articles selected were based on studies executed in several countries or regions, however, the United States of America (USA) was the main source of evidence: USA  $n = 24$ , Canada and Israel  $n = 2$ , Netherlands, Australia, Taiwan, Spain, Italy, Belgium, Germany  $n = 1$ , total of Europe  $n = 11$ . Most articles reported on an ADHD group and a group of controls ( $n = 25$ ). Results are reported based on their content and their assigned domain. Topics were articles related to training, coaching, instruction, educational consultation; educational environment; pharmacological treatment; symptoms, symptom severity and persistence of symptoms; predictive factors or associations of ADHD with academic outcomes; self-concept; or working memory or a specific skill.

#### 3.1. Training, Coaching, Instruction, Educational Consultation

A total of five studies were related to this domain, three from USA and two from Israel (Gol & Jarus, 2005; Shalev, Tsai, & Mevorach, 2007; Dupaul et al., 2006; Curtis, Chapman, Dempsey, & Mire, 2013; Parker, Hoffman, Sawilowsky, & Rolands, 2013). The studies focused on the possible beneficial effect of certain types of training for school-children with ADHD ( $n = 4$ ; age 6 - 13) and college students (year: freshman to senior)



**Figure 1.** Flow diagram of screened and included articles.

**Table 2.** Country of origin, sample size and research questions of selected articles.

Country	Sample size	Research question	Reference
Articles relating to training, coaching, instruction, educational consultation			
USA	175	<ul style="list-style-type: none"> <li>What is the differential effect of two models of educational consultation (typical and behavioral) on the academic functioning of sample ADHD students?</li> </ul>	(Dupaul et al., 2006)
USA	26	<ul style="list-style-type: none"> <li>What is the classroom outcome for children with ADHD following an intervention called Family Skills Training (behavioral parent training and child focused self-regulation training) for ADHD-Related Symptoms?</li> </ul>	(Curtis et al., 2013)
USA	19	<ul style="list-style-type: none"> <li>What is the effect of ADHD coaching on students' perceptions of the process they used to achieve or maintain academic goals such as grade point average?</li> <li>What benefits do students associate with coaching services?</li> </ul>	(Parker et al., 2013)
Israel	27 ADHD 24 controls	<ul style="list-style-type: none"> <li>What is the functioning in daily tasks of children with ADHD compared with those without ADHD?</li> <li>What is the efficacy of occupational therapy intervention?</li> </ul>	(Gol & Jarus, 2005)
Israel	20 ADHD 16 controls	<ul style="list-style-type: none"> <li>Can attention deficits of children with ADHD be ameliorated by an individualized training program (exercising the attentional networks)?</li> </ul>	(Shalev et al., 2007)
Articles relating to educational environment or tool			
Italy	27 ADHD 28 ADHD + LD 29 controls	<ul style="list-style-type: none"> <li>Are three types of knowledge better acquired and retained when provided by a hypermedia tool as opposed to traditional instruction?</li> <li>Do hypermedia tools yield the same better learning outcomes (if any) both in the acquisition and in the retention phase?</li> <li>Do groups differ in knowledge assimilation according to the instructional setting to which they are assigned?</li> </ul>	(Fabio & Antonietti, 2012)
USA	19 ADHD 16 controls	<ul style="list-style-type: none"> <li>Are children with ADHD more affected by distractions in the virtual classroom than those without ADHD?</li> </ul>	(Adams et al., 2009)
Belgium	31 ADHD 31 controls	<ul style="list-style-type: none"> <li>Are attention-related problems in the classroom exacerbated in children with ADHD by specific class conditions?</li> <li>Does the teacher's supervision level influence the relation between class-context and on-task behavior?</li> </ul>	(Imeraj et al., 2013)
Germany	55 ADHD 55 controls	<ul style="list-style-type: none"> <li>How much on-task behavior and what kind of on-task behaviors do children with ADHD display?</li> <li>How would the lesson context affect the behavior of students with ADHD?</li> <li>Are there differential effects of context on the behavior of students with ADHD compared with matched control students?</li> </ul>	(Lauth et al., 2006)
Articles relating to pharmacological treatment			
USA	92 ADHD 143 controls	<ul style="list-style-type: none"> <li>What is the relationship between ADHD medications, study habits, and academic achievement of ADHD diagnosed undergraduates?</li> </ul>	(Advokat et al., 2011)
USA	24 ADHD 26 controls	<ul style="list-style-type: none"> <li>What is the effect of lisdexamfetamine (three doses) on ADHD symptoms and executive functioning vs. placebo?</li> </ul>	(Dupaul et al., 2012)
USA	45 ADHD	<ul style="list-style-type: none"> <li>What is the effect of methylphenidate on academic achievement and behavior vs. placebo?</li> </ul>	(Evans et al., 2001)
Spain	34 ADHD 16 controls	<ul style="list-style-type: none"> <li>What is the therapeutic effect of a pharmacological intervention compared to a psycho-pedagogical treatment?</li> </ul>	(Miranda et al., 2006)
Articles relating to symptomatology, symptom severity and persistence of symptoms			
USA	2844 ADHD	<ul style="list-style-type: none"> <li>What is the importance of acknowledging subtype symptoms in outcomes for children with ADHD as associated with interventions across time?</li> </ul>	(Barnard et al., 2010)
USA	326 ADHD 213 controls	<ul style="list-style-type: none"> <li>What is the relationship between attendance and academic Grade Point Average?</li> <li>Does symptom severity predict poorer outcomes within the ADHD group above and beyond the contribution of IQ and parental education?</li> </ul>	(Kent et al., 2011)
USA	147 USA 273 China	<ul style="list-style-type: none"> <li>What is the relationship between ADHD symptomatology and academic and social adjustment to college, self-confidence, and study skills?</li> <li>What is the separate influence of inattentive and hyperactive symptoms, while controlling for depression, which may affect the ability to pay attention?</li> </ul>	(Norvilitis et al., 2010)



## Continued

USA	68 ADHD 19 former ADHD 200 controls	<ul style="list-style-type: none"> <li>Do ADHD symptoms predict college adjustment after the association between personality traits and adjustment is corrected for?</li> </ul>	(Rabiner et al., 2008)
Taiwan	333 persistent ADHD 166 non-persistent ADHD 266 controls	<ul style="list-style-type: none"> <li>Is childhood ADHD negatively associated with school performance?</li> <li>Does the current persistence of ADHD predict adverse outcomes?</li> </ul>	(Wu & Gau, 2013)
Articles relating to predictive factors or associations of ADHD with academic outcomes			
USA	15 ADHD	<ul style="list-style-type: none"> <li>What are the factors that help college students with ADHD?</li> <li>What are the factors that hinder college students with ADHD?</li> </ul>	(Meaux et al., 2009)
USA	153 current ADHD 73 past ADHD 3.153 controls	<ul style="list-style-type: none"> <li>How do students with ADHD function in academic, social, and emotional domains relative to students without ADHD?</li> <li>What is the predictive association between ADHD and students' adjustment?</li> </ul>	(Blase et al., 2009)
Articles related to self-concept			
USA	21 ADHD 20 controls	<ul style="list-style-type: none"> <li>What are the reported levels of college adjustment, self-esteem, and social skills of ADHD students vs. non-ADHD peers?</li> <li>Do social skills and self-esteem act as mediators in the relationship between ADHD and college adjustment?</li> </ul>	(Shaw-Zirt et al., 2005)
Australia	87 ADHD 87 and 3.374 controls	<ul style="list-style-type: none"> <li>Are there differences in academic buoyancy (students' capacity to successfully overcome setback) between students with and without ADHD?</li> </ul>	(Martin, 2014)
USA	130 ADHD 94 controls	<ul style="list-style-type: none"> <li>Do college students with ADHD differ from students without ADHD in their endorsement of specific behavioral information?</li> <li>Do college students with ADHD differ from college students without ADHD in their endorsement of global ratings of behavior?</li> <li>Are college students with ADHD more likely than students without ADHD to give ratings indicating a positive illusory bias?</li> </ul>	(Prevatt et al., 2012)
USA	17 previous ADHD 19 controls	<ul style="list-style-type: none"> <li>What is the performance of college students diagnosed with ADHD relative to peers without the diagnosis on a number of independent measures, including academic performance, self-concept and psychological well-being?</li> </ul>	(Wilmschurst et al., 2011)
USA	102 ADHD 499 controls	<ul style="list-style-type: none"> <li>What is the level of self-esteem among the study population?</li> <li>Do these ratings vary by disorder characteristics and medication use?</li> <li>Can we identify predictors of low self-esteem while adjusting for socio-demographic factors?</li> </ul>	(Bussing et al., 2000)
Articles related to working memory or a specific skill			
USA	68 ADHD	<ul style="list-style-type: none"> <li>What is the performance and use of instructional accommodations of students with ADHD in foreign language courses?</li> </ul>	(Sparks et al., 2004)
Canada	16 ADHD 30 controls	<ul style="list-style-type: none"> <li>How does working memory work in university students with ADHD?</li> <li>Is working memory related to academic functioning at the university level?</li> </ul>	(Gropper & Tannock, 2009)
Canada	26 ADHD 6 ADHD + LD 30 LD	<ul style="list-style-type: none"> <li>Will working memory training lead to improvements in working memory performance on cognitive tasks?</li> <li>Will the effects of working memory training generalize to daily-life activities involving working memory, such as academic performance and self-regulation?</li> <li>Are gains in functioning persistent (i.e., for at least two months)?</li> </ul>	(Gropper et al., 2014)

## Continued

USA	44 ADHD 42 controls	• Auditory and visual-spatial working memory: what effect does distraction have?	(Lineweaver et al., 2012)
USA	24 ADHD 24 controls	• What is the ability of ADHD adults to perform a visual cancellation task compared with health controls?	(Jones et al., 2008)
USA	20 ADHD 20 controls	• What are time estimation abilities of college students with and without ADHD?	(Prevatt et al., 2011)
NL	62 ADHD	• Does computerized working memory training with game elements enhance motivation and training efficacy in children with ADHD vs. standard working memory training?	(Prins et al., 2011)
USA	31 ADHD 27 controls	• What is the effect of ADHD on written expression compared to a control group?	(Semrud-Clikeman & Harder, 2011)
USA	14 ADHD 42 ADHD + LD 16 LD	• Is explanatory style predictive of success as measured by Grade Point Average for college students with learning disorder and attention disorders?	(Shmulsky & Gobbo, 2007)

USA: United states of America; NL: The Netherlands.

(Parker et al., 2013). All five studies reported on beneficial effects of training, consultation or coaching on academic functioning. Effects were reported for specific tasks (math or reading), but also for the basic characteristics of ADHD related to externalizing behavior and attention problems with the largest influence on attention problems. Amongst others, coaching helped to be more self-regulated (ability to control one's emotions, behavior, and desires in the face of external demands), which was reported by students (college sample), teachers (children with ADHD showed better motivation and study skills) and parents (reduction in symptoms of inattentiveness). So, training could improve attention in school and account for more self-regulated behavior.

### 3.2. Educational Environment or Tool

Four studies reported on educational environment or a tool used to deliver knowledge to either an ADHD or a control group (Origin Italy, USA, Belgium and Germany; respondent's age 6 - 14 years) (Fabio & Antonietti, 2012; Adams, Finn, Moes, Flannery, & Rizzo, 2009; Imeraj et al., 2013; Lauth, Heubeck, & Mackowiak, 2006). Topics related to acquiring and attaining knowledge, distraction, and behavior in general in relation to class conditions (class structures and academic content types). Children with ADHD were more distracted compared to controls and had a shorter on-task span during academic tasks (mathematics, language, and sciences). However, this shorter on-task span was not present during music and arts. Also, learning via a computer-based service yielded better results compared to traditional instruction and could specifically improve outcomes related to attention deficits. Another environmental outcome was better functioning while working in a small group compared to individual tasks or whole class work. Individual task work accounted for more problems than whole class work.

### 3.3. Pharmacological Treatment

Four studies were related to ADHD and pharmacological treatment, three were originated in USA, one in Spain (Miranda, Jarque, & Rosel, 2006; Evans et al., 2001; Dupaul et al., 2012; Advokat, Lane, & Luo, 2011). Studies were focused on the effect of different types of pharmacotherapy (stimulants and non-stimulants) on study habits, academic achievement in general, ADHD symptoms and executive functioning. One of the studies was a double-blind, placebo-controlled study reporting a positive effect on symptom relieve (inattention and hyperactivity), but this study was not specifically designed to report on academic achievements (Dupaul et al., 2012). The other studies reported beneficial effects of pharmacological treatment on concentration, planning, organization, executive functioning and working memory. More specifically to studying, effects on note-taking quality and homework completion were reported.

### 3.4. Symptoms, Symptom Severity and Persistence of Symptoms

The DSM-IV divides the symptoms of ADHD into two groups: symptoms of inattention and symptoms of hyperactivity-impulsivity (American Psychiatric Association, 2000). Five studies reported on subtype symptoms,

**Table 3.** Outcomes and reported associations of selected articles.

Main outcome	Reference
Articles relating to training, coaching, instruction, educational consultation	
<ul style="list-style-type: none"> <li>The findings support academic consultation to enhance academic functioning in children with ADHD.</li> <li>Large effect sizes (<math>&gt;0.80</math>): math calculation, math fluency, reading fluency and passage comprehension.</li> </ul>	(Dupaul et al., 2006)
<ul style="list-style-type: none"> <li>Results indicated significant classroom improvements for externalizing behaviors and attention problems with medium and large main effects.</li> <li>Significant results were observed for changes in ADHD symptoms of inattention due to family training (<math>p &lt; 0.01</math>).</li> </ul>	(Curtis et al., 2013)
<ul style="list-style-type: none"> <li>Students were harmonious in their belief of coaching improving how they worked on academic goals.</li> <li>Coaching helped to be more self-regulated: to set more realistic and specific goals, use effective time management, be able to avoid distraction in class.</li> </ul>	(Parker et al., 2013)
<ul style="list-style-type: none"> <li>Children with ADHD improved after a social skills training aiming to improve occupational performance and no longer differed from the children without ADHD (<math>p &lt; 0.008</math>).</li> <li>Difficulties were related to: energy, time, and adaptation, following instructions and terminating the task, difficulties in organizing actions, talking too frequently.</li> </ul>	(Gol & Jarus, 2005)
<ul style="list-style-type: none"> <li>The participants showed improvement in non-trained measures of reading comprehension, and passage copying as well as a reduction of reports of inattentiveness (<math>p &lt; 0.05</math>).</li> <li>Children with ADHD received a computerized attentional training program composed to activate sustained, executive and selective attention, and orienting of attention.</li> </ul>	(Shalev et al., 2007)
Articles relating to educational environment or tool	
<ul style="list-style-type: none"> <li>Hypermedia instruction (computer-based devices designed to promote learning in educational settings) produced better learning outcomes than traditional instruction.</li> </ul>	(Fabio & Antonietti, 2012)
<ul style="list-style-type: none"> <li>Children with ADHD were more affected by distractions in the virtual reality classroom while performing a continuous performance task than those without ADHD (non-significant).</li> </ul>	(Adams et al., 2009)
<ul style="list-style-type: none"> <li>Children with ADHD were significantly less on-task than controls during individual work and whole class group teaching, but not during small group work.</li> <li>Children with ADHD had significantly shorter on-task span during academic tasks (mathematics, language, and sciences), but not during music and arts.</li> </ul>	(Imeraj et al., 2013)
<ul style="list-style-type: none"> <li>ADHD students displayed more problems of actively disruptive behavior across classroom contexts (<math>p &lt; 0.01</math>).</li> <li>More disruptive behavior was observed during individual silent work compared with normal classroom teaching.</li> </ul>	(Lauth et al., 2006)
Articles relating to pharmacological treatment	
<ul style="list-style-type: none"> <li>ADHD students using stimulant medication said the drugs helped them concentrate and organize better.</li> </ul>	(Advokat et al., 2011)
<ul style="list-style-type: none"> <li>Lisdexamfetamine was associated with large reductions in ADHD symptoms and improvement in executive functioning.</li> <li>Linear lisdexamfetamine effects were found for specific aspects of executive functioning related to task management, planning, organization, study skills, and working memory.</li> </ul>	(Dupaul et al., 2012)
<ul style="list-style-type: none"> <li>Data showed significant improvement of methylphenidate on academic measures.</li> <li>Note-taking quality, written language usage and productivity, on-task and disruptive behavior and homework completion.</li> </ul>	(Evans et al., 2001)
<ul style="list-style-type: none"> <li>Both medication and pedagogical interventions were effective for reducing the main symptoms of ADHD (inattention and hyperactivity).</li> </ul>	(Miranda et al., 2006)
Articles relating to symptomatology, symptom severity and persistence of symptoms	
<ul style="list-style-type: none"> <li>There are significant differences in academic achievement according to long-term stimulant treatment status within each subtype symptom class (over a period of 4 years).</li> <li>Associations between receiving stimulant treatment and academic achievement were inattentive: 0.21; hyperactive-impulsive: 0.11; and combined class: 0.38.</li> </ul>	(Barnard et al., 2010)
<ul style="list-style-type: none"> <li>Adolescents with ADHD completed and turned in a significantly lower percentage of assignments were significantly less likely to be working up to their potential.</li> <li>Baseline symptom severity of ADHD, oppositional defiant disorder and conduct disorder for adolescents with ADHD were not significant predictors of for grade point average, attendance, drop-out, or class placement.</li> <li>IQ was significantly lower in the ADHD group (102 vs. 111; <math>p &lt; 0.001</math>), they were more absent (<math>p &lt; 0.01</math>), and were more tardy (<math>p &lt; 0.01</math>).</li> <li>For academic for grade point average, R2 values were as follows: group only = 0.80, IQ only = 0.78, parent education only = 0.78, and full model = 0.88.</li> </ul>	(Kent et al., 2011)

## Continued

<ul style="list-style-type: none"> <li>Higher levels of inattentive symptoms were related to decreased academic and social adjustment, career decision-making, self-efficacy, and poorer study.</li> <li>Depression itself clearly plays a role in college students' adjustment, but this appears to be independent of the role of ADHD symptomatology.</li> <li>Higher levels of ADHD were associated with higher levels of depression (<math>p &lt; 0.001</math>), depression significantly predicted social adjustment (<math>p &lt; 0.001</math>).</li> <li>Higher levels of ADHD were related to lower levels of academic adjustment (<math>p &lt; 0.01</math>), poorer study skills (<math>p &lt; 0.001</math>), and lower levels of social adjustment to college (<math>p = 0.31</math>).</li> </ul>	(Norvilitis et al., 2010)
<ul style="list-style-type: none"> <li>Students with ADHD reported more academic concerns and depressive symptoms. This was explained by higher rates of inattention among students with ADHD and was unrelated to hyperactivity.</li> <li>Students currently diagnosed with ADHD reported more concerns about their academic performance and higher rates of depressive symptoms (effect size 0.48 and 0.37).</li> <li>Inattentive symptoms remained a significant predictor of depressive symptoms after personality factors were controlled for <math>p &lt; 0.001</math>.</li> </ul>	(Rabiner et al., 2008)
<ul style="list-style-type: none"> <li>The most consistent correlates for all domains of impaired school functioning were youth reported and mother reported inattention symptoms and increased age.</li> <li>Both ADHD groups (persistent and non-persistent ADHD) had lower full-scale IQ (<math>p &lt; 0.001</math>).</li> </ul>	(Wu & Gau, 2013)
Articles relating to predictive factors or associations of ADHD with academic outcomes	
<ul style="list-style-type: none"> <li>Identification of three global themes: gaining insight about ADHD, managing life and utilizing sources of support. Each global theme contains factors that hinder, as well as factors that help the college student with ADHD.</li> <li>Persistent symptoms created challenges to academic success because of poor time management and organization skills, difficulty staying focused, failure to complete work on time, poor motivation, poor reading and study skills and difficulty sleeping and getting up in the morning.</li> </ul>	(Meaux et al., 2009)
<ul style="list-style-type: none"> <li>Relative to other students, those with self-reported ADHD reported more academic concerns, depressive symptoms, social concerns, and emotional instability.</li> <li>For groups with current and past symptoms, inattention was present to a larger extent compared to hyperactivity (1.23/0.88 vs. 1.00/0.73).</li> </ul>	(Blase et al., 2009)
Articles related to self-concept	
<ul style="list-style-type: none"> <li>The results suggest that the relation between ADHD and college adjustment is partially mediated by self-reported levels of self-esteem (<math>p = 0.001</math>).</li> <li>There were significant main effects for group (<math>p = 0.001</math>) and gender (<math>p &lt; 0.03</math>). Female participants in general reported better social skills than male participants do.</li> </ul>	(Shaw-Zirt et al., 2005)
<ul style="list-style-type: none"> <li>There is a significant association between academic buoyancy (students' capacity to successfully overcome setback and challenge) and outcomes for students with ADHD.</li> <li>For the ADHD and non-ADHD groups, academic buoyancy is positively correlated with achievement (0.19 and 0.13) and engagement (0.38 and 0.35).</li> </ul>	(Martin, 2014)
<ul style="list-style-type: none"> <li>ADHD participants were significantly more likely to engage in the positive illusory bias (effect of people thinking they are "better than average") for work skills ratings (<math>p = 0.005</math>).</li> </ul>	(Prevatt et al., 2012)
<ul style="list-style-type: none"> <li>Students with ADHD reported significantly higher paternal support than controls (<math>p &lt; 0.04</math>) who reported significantly greater support from friends (<math>p &lt; 0.02</math>).</li> <li>There was a significant effect for gender for grade point average, (females scoring higher than males; <math>p &lt; 0.022</math>).</li> <li>For students with ADHD, environmental mastery (competence in managing their environment, making effective use of available opportunities) significantly predicted total self-concept (<math>p &lt; 0.009</math>).</li> </ul>	(Wilmshurst et al., 2011)
<ul style="list-style-type: none"> <li>Children with ADHD criteria had significantly lower self-esteem (<math>p &lt; 0.05</math>).</li> <li>Total self-esteem scores varied significantly by type of associated disorders and were lowest for children with comorbid internalizing symptoms (<math>p &lt; 0.001</math>). ADHD alone: <math>n = 52</math>; Piers-Harris Self-Concept Scale (PHSCS) 65.4 – ADHD + externalizing: <math>n = 40</math>; PHSCS 61.9 – ADHD + internalizing: <math>n = 18</math>; PHSCS 46.8 – ADHD + externalizing + internalizing: <math>n = 18</math>; PHSCS 47.7.</li> </ul>	(Bussing et al., 2000)
Articles related to working memory or a specific academic skill	
<ul style="list-style-type: none"> <li>Two thirds of the students with ADHD passed all of their foreign language courses without the use of instructional accommodations (for example for example extended time).</li> </ul>	(Sparks et al., 2004)
<ul style="list-style-type: none"> <li>The ADHD group displayed significant weaknesses on auditory-verbal working memory tasks.</li> <li>Within the entire sample, there was a significant relationship between for grade point average and auditory-verbal working memory (<math>r = 0.405</math>, <math>p &lt; 0.01</math>).</li> </ul>	(Gropper & Tannock, 2009)

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| • Participants receiving computerized working memory training showed significantly greater improvements and self-reported fewer ADHD symptoms and cognitive failures.   | (Gropper et al., 2014)           |
| • Students with ADHD demonstrated worse auditory working memory.  | (Lineweaver et al., 2012)        |
| • The ADD/ADHD group made significantly more left-sided omission errors.  | (Jones et al., 2008)             |
| • Controlling for cognitive ability, ADHD participants were significantly different on all dependent measures related to time estimation abilities ( $p < 0.05$ ). Controlling for IQ did not change the main outcomes.   | (Prevatt et al., 2011)           |
| • Children using the game working memory training showed greater motivation, better training performance, and better working memory (i.e., higher scores on a working memory task) versus the regular working memory training.                                  | (Prins et al., 2011)             |
| • No statistically significant differences are found between groups on measures of executive function and written expression.   | (Semrud-Clikeman & Harder, 2011) |
| • Significant positive correlations are found between the Attribution Style Questionnaire to measure causal thinking scores and for grade point average for the subgroup with co-occurring ADHD and learning disabilities and for the three subgroups combined. | (Shmulsky & Gobbo, 2007)         |
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symptom severity, and persistence of symptoms (Barnard, Stevens, To, Lan, & Mulsow, 2010; Kent et al., 2011; Norvilitis, Sun, & Zhang, 2010; Rabiner et al., 2008; Wu & Gau, 2013). Four studies were USA based; one was executed in Taiwan (Wu & Gau, 2013). One study was both related to pharmacological treatment (specifically with a stimulant) and subtype symptom class (Barnard et al., 2010). The result was that especially inattentiveness was related to worse academic outcomes with effects on self-efficacy and depressive symptoms. Depressive symptoms independently turned out to be related to college and social adjustment. Baseline symptom severity turned out not to be significant predictors for grade point average, class attendance, or drop-out, although the ADHD group was significantly more absent and tardy compared to controls. Two studies reported on IQ and concluded on a significantly lower IQ for ADHD students (Kent et al., 2011; Wu & Gau, 2013).

### 3.5. Predictive Factors or Associations of ADHD with Academic Outcomes

Two USA studies related to factors associated with ADHD and problems in college specifically (Meaux, Green, & Broussard, 2009; Blase et al., 2009). One study also searched for factors that can help students with ADHD, although only 15 respondents were included in this qualitative study (Meaux et al., 2009). Inattention turned out to be present to a larger extent compared to hyperactivity. Students with ADHD reported challenges to academic success due to difficulties in focus, completing work in time and poorer time management and organization skills. Coping with the ADHD and managing challenges in everyday life were also mentioned by the ADHD group related to difficulties with academic success. Depressive symptoms and emotional instability were present to a larger extent in the ADHD population.

### 3.6. Self-Concept

One's self-concept (also called self-construction, self-identity, self-perspective or self-structure) is a collection of beliefs about oneself that includes elements such as academic performance gender roles, sexuality and racial identity and accounts for the regard for oneself as a person (Wilmschurst, Peele, & Wilmschurst, 2011). Four studies from USA and one from Australia were focused on studies related to (predictors of low) self-esteem, ratings of own behavior, and psychological well-being (Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005; Martin, 2014; Prevatt et al., 2012; Wilmschurst et al., 2011; Bussing, Zima, & Perwien, 2000). All four studies were based on an ADHD group compared to controls. It is suggested that reported levels of self-esteem mediates the relation between ADHD and college adjustment. Next to that, children with ADHD reported significantly lower self-esteem and scores were lowest for children with ADHD and comorbid internalizing problems, especially in the areas of anxiety and popularity, although females tend to report better social skills. Medication use was not a predictor of lower self-esteem scores. Students' capacity to successfully overcome setback and challenge (academic buoyancy) was significantly associated with outcomes for students with ADHD and also academic buoyancy was positively correlated with academic achievement and engagement. On the other hand, one study reported that students with ADHD were more engaged in the bias of thinking they are "better than average"

(positive illusory bias), which is in contrast with lower self-esteem.

### 3.7. Working Memory or a Specific Skill

Working memory refers to the ability to temporarily maintain and manipulate information necessary for achieving a certain goal (Gropper, Gotlieb, Kronitz, & Tannock, 2014). The largest group of studies ( $n = 9$ ) reported on working memory or related to time estimation, explanatory style, or written expression (Sparks, Javorsky, & Philips, 2004; Gropper et al., 2014; Gropper & Tannock, 2009; Lineweaver et al., 2012; Jones, Craver-Lemley, & Barrett, 2008; Prevatt, Proctor, Baker, Garrett, & Yelland, 2011; Prins, Dovis, Ponsioen, ten, & van der Oord, 2011; Semrud-Clikeman & Harder, 2011; Shmulsky & Gobbo, 2007). ADHD students display significant weaknesses in the auditory-verbal working memory tasks compared to controls and were significantly worse in time estimation abilities. When using computer-based working memory training with game elements, ADHD children showed better training performance, and better working memory outcomes compared to regular computer-based training, although students with ADHD trained with computerized working memory training also showed significantly greater improvements and self-reported fewer ADHD symptoms and cognitive failures. Executive function, written expression and passing of foreign language courses did not relate to significant differences between ADHD and control students.

## 4. Discussion

This systematic review focused on the question: Is it possible to identify factors that have been demonstrated to be associated with educational and academic performance in ADHD based on the current available evidence, and if so: which factors are those? This question was raised, since based on available literature it can be concluded that there is a certain negative impact of ADHD on school outcome, but without consensus on the specific cause for this impact. The study focused on articles presenting results of data-based analysis related to the main topic ADHD and specific keywords related to education. A total of 35 studies met the eligibility criteria for this analysis. They were analyzed by means of narrative synthesis since outcomes were too heterogeneous to combine results. The articles related to seven different domains; educational training, educational environment; pharmacological treatment; symptomatology, associations of ADHD with academic outcomes, self-concept, and specific skills.

One main finding stands out when trying to answer the question: is it the ADHD itself that causes the impact on educational achievements or are underlying factors at stake? When reviewing all included studies, the main source of problems seems to be associated with the inattentive symptoms of ADHD and not so much in the hyperactive or impulsive symptoms. This outcome is different than expected, since hyperactive symptoms, which are more prominently pronounced, are usually the main cause of referral to clinical evaluation, probably since teachers and other students experience burden of particularly those symptoms (Skounti, Philalithis, & Galanakis, 2007; Polanczyk et al., 2007). It also has been reported that the prevalence of the hyperactive-impulsive subtype decreases when children get older, whereas the inattentive subtype increases (Nolan, Gadow, & Sprafkin, 2001). This is a very important finding in the light of the results of this systematic review. The ongoing impact of ADHD, which frequently maintains into adulthood, seems to be associated with inattentiveness and according to our review, it is the inattentiveness that seems to be associated with educational performance. This yields important information as to which areas to target when it comes to opting for clinical or non-clinical interventions in order to mitigate the impact of the ADHD.

Studies relating to educational environment and content showed that ADHD children in general had a shorter on-task span, but were better able to perform in small group work, in music and art classes and in learning via a computer-based service, especially when including game-elements. ADHD students showed weaknesses in the auditory-verbal working memory. Studies reporting on training and coaching concluded on beneficial effects of different training types, with especially positive effects on inattentive symptoms and related behavior. Pharmacological treatment showed beneficial effects on concentration, planning, organization, executive functioning and working memory. Problems in school can also be related to occupational achievements, since individuals that are diagnosed with ADHD often continue to have problems during adulthood and into their working life (Barkley, Fischer, Smallish, & Fletcher, 2002). The negative impact of ADHD on work performance of adults has been demonstrated in extensive surveys (de Graaf et al., 2008; Kessler et al., 2005). ADHD is associated with 22 - 35 annual days of lost role performance compared to respondents without ADHD related to decre-



ments in work performance or absence (de Graaf et al., 2008; Kessler et al., 2005). These problems in working life might be mitigated when proper help is offered when in school.

A factor that might play a role in the large impact of inattentive symptoms on educational and academic outcomes is the existence of comorbidities. In ADHD, symptom overlap or comorbidity with other conditions is the rule rather than the exception (Rommelse et al., 2009; Gillberg et al., 2004). In our review, ADHD was required to be the major area of interest of the study, but comorbidity was not necessarily an exclusion criterion. The review concluded that the inattentiveness also affected self-efficacy and depressive symptoms which in turn influence the relation between ADHD and educational and academic outcome. Also, children with ADHD are at high risk of adolescent depression (Chronis-Tuscano et al., 2010). Next to the influence of inattentiveness on school outcome, our review found that depressive symptoms also influence the effect of ADHD and academic outcome. Another phenomenon frequently mentioned in this respect that could be involved in comorbidity and academic outcome is stigmatization (DosReis, Barksdale, Sherman, Maloney, & Charach, 2010). Stigma can have a harmful effect on social functioning and can increase depressive symptoms (Shaw-Zirt et al., 2005). Stigmatization can be obvious and direct, for example when a classmate makes a negative remark about the ADHD (DosReis et al., 2010). Our review showed that social functioning of ADHD children improved after a social skills training and therefore potentially could reduce the harmful effect of stigmatization. Next, our review found that female participants in general reported better social skills than male participants do. Taking this into account, stigmatization might affect boys more than girls, due to more obvious symptoms (hyperactivity) and having less social skills to begin with.

As with all research, the value of a systematic review depends on what was done, what was found, what was reported and what was concluded (Moher et al., 2009). A limitation of this review is related to its sources: selection of patients is not always clear. In our review, there was no specific focus on the method of diagnosing ADHD. This was decided upon, since no clear cut-of could be established of which ADHD diagnostic would be included. We choose not to focus on this specific aspect of the studies, since no evidence would have been left for inclusion in this review due to the lack of a uniform method of diagnosis. We therefore had to rely on the investigators' discretion in guaranteeing the validity of the diagnosis of ADHD in their subjects. However, future studies might choose to specifically focus on method of diagnosing ADHD and the influence on educational outcomes. As described, comorbidity is often present in children and adolescents with ADHD. In the articles included in our review, we did not specifically focus on the existence of comorbidity or the moderating effect that comorbidity could have. Finally, treatment status of respondents was not always reported (adequately), so the establishment of a clear relationship between impact of ADHD and the mitigation by certain treatment types cannot properly be made.

This review highlights areas of interest for future studies. As school systems and referring systems differ between countries, it is recommendable to perform studies on the effect of ADHD in several countries at the same time. Finally, more longitudinal studies might contribute a lot to the knowledge on the effect of ADHD on education and academic performance and occupational performance later in life.

## 5. Conclusion

The main association of educational and academic problems seems to be the inattentive symptoms (or subtype) of ADHD. This outcome is different than expected, since hyperactive symptoms are more prominently pronounced. The answer to the question if the ADHD itself causes the impact on negative educational outcomes or that underlying factors at stake is that both seem to be true. The inattentive symptoms of ADHD tend to be associated with most of the problems experienced, but also other factors like educational environment, depression and self-concept seem to play a role. Since ADHD is considered a treatable disorder the negative impact on educational and academic outcome has the potential to be mitigated if patients are diagnosed and treated adequately (Weiss, Gadow, & Wasdell, 2006; Matza et al., 2004; Barkley, 2008). More important for the patients at stake, next to a relief of clinical symptoms, proper help when diagnosed with ADHD might also help children and adults to achieve educational goals that now are sometimes out of reach. Especially, overcoming negative outcomes of inattentiveness should be a major focus, next to improvement of social skills to deal with everyday life in schools (especially in males). Simple interventions could be found in environmental changes, since children with ADHD showed better functioning while working in a small group. Lower education outcome in its turn will also have an economic impact in the end (Biederman et al., 2008). More attention and support should be

given to ADHD students to improve their chances in society and the economic influence of ADHD based on lower academic levels should be an important foundation when it comes to allocating resources to support ADHD patients.

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# A Descriptive Study: Observing Behavioral Patterns of Preschool Children in Turkey and Belgium

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## Abstract

Children should have flexible and adaptable repertoire to accomplish qualified social skills. In order to achieve this, teachers have a significant responsibility to propose crucial opportunities to children during classroom activities. Although teachers prefer to use universal approaches to promote prosocial behaviors rather than to remove maladaptive behaviors, cultural issues in social problem solving skills would be effective on their behavioral pattern of treatment to children. In this study, it was evaluated to see possible differences between Turkish and Flemish preschool children in their behavioral patterns. It was found that there was only significant difference in prosocial dimension of Drexel Early Childhood Behavior Rating Scale (Shure, 2005). In aggression and introversion dimensions, it was not found any significant difference between the two groups. However the mean scores of Flemish preschoolers in aggression dimension of the scale were found less than Turkish preschoolers. Findings were discussed based on literature.

## Keywords

Preschool Education, Prosocial Behaviors, Classroom Organization, Cultural Differences

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## 1. Introduction

Social problem solving skills of children and their capacity to solve problems are very crucial when they try to cope with various problem situations in classroom. Although some of children have enough capacity to achieve this, some children cannot maintain well-adjusted relationships because they are not competent to show prosocial behavior for positive interactions (Hennessy & Martin, 1992). It has been suggested that children should



have flexible and adaptable repertoire to accomplish qualified social skills such as identifying their own and other's feelings, encouraging skills associated with listening and paying attention, taking responsibility of their decisions, ability to cope with frustration, successful emotional control, managing their own's feelings and behaviors, building positive relationships (Spence, 2003; Zins, Bloodworth, Weissberg, & Walberg, 2007; Powell, Dunlap, & Fox, 2006; Shure & Spivack, 1980, 1982, 1988; Webster-Stratton, Reid, & Hammond, 2001; Reid, Webster-Stratton, & Hammond, 2007).

In this respect, teachers have a key role to let children to deal with problems more competently and create more peaceful classroom atmosphere. According to Bingham (1983), teachers first should be aware of social problems emerging between children as a natural process of interactions. Teachers have a significant responsibility to make possible to enrich interpersonal relationships of children because of several opportunities to achieve this goal. Teachers can integrate specific problem solving training into their curriculum, provide students to practice those skills and promote cognitively based newly learned behavioral skills in the classroom (Zins et al., 2007; Webster-Stratton & Reid, 2008). Teaching children to think of more prosocial solutions to their problems and to evaluate which solutions are better choices and more likely to lead to positive consequences than others which would be supportive to improve their alternative problem solving thinking skills.

Another crucial issue is to arrange classroom with various educational materials stimulating children to initiate involvement in those activities which should be scheduled and planned systematically. The complexity of those activities also determines the likelihood of children's positive involvement in such activities. Children who are fully involved in classroom activities are unlikely to engage in disruptive behavior (Powell, Dunlap, & Fox, 2006); they tend to solve problems by using more peaceful ways cooperatively (Goffin & Tull, 1985; Honig & Wittmer, 1996). When curricula has been evaluated, it could be easily noticed that teachers usually use typical songs, stories, role-plays, and other activities in order to promote social emotional learning abilities of children in early childhood education (Denham & Burton, 2003). Those activities and approaches or methods have been used to keep well-being of children as a universal point of view. It has been tried to promote the positive prosocial dimension rather than preventive efforts by considering individual differences (Mayer, 1995; Shure, 2001).

Although teachers prefer to have universal approaches or to use general methods to succeed promoting prosocial behaviors rather than removing maladaptive behaviors, cultural, background, social welfare, economic conditions, educational viewpoint of that nationality, school policies would be effective on their behavioral pattern of treatment to children. Those all, in turn, may affect different behavioral dimensions of children in a wide range from negative to positive in classroom settings. For this reason it is needed to address differences in behavioral dimensions of children in diverse cultures to catch constructive curriculum to enhance social problem solving skills of children.

The goal of this study is to evaluate whether there would be differences between Turkish and Flemish preschool children in their behavioral patterns. It was hypothesized that while prosocial behaviors of Flemish preschoolers were better than Turkish preschoolers, aggressive behaviors were less than Turkish peers. It was not expected any difference between two groups in terms of introversion dimension.

## 2. Method

Five (57% girls, 43% boys) and 6 (49% girls, 51% boys) years old 53 Turkish and Flemish children who have been attending public preschools both full-time and part-time in Izmir (Turkey) and in Hasselt (Belgium) were participated in the study. Twenty six children were from Flemish preschools, 27 children were from Turkish preschools. There were no significant differences between two groups in terms of gender and age. Children who had no physical, cognitive, visual and hearing disabilities were randomly selected from the classroom list considering gender ratio.

### 2.1. Instruments

*Drexel Early Childhood Behavior Rating Scale* (Shure, 2005). This is a teacher, parent and professional rated scale including 12 items which is used to specify behavioral dimensions of children in their interactions. Those behavioral dimensions cover overt and relational aggressive behaviors, prosocial behaviors and also introversive behavior patterns. Evidence of face validity of the scale includes pre intervention to post intervention findings in expected directions.

The validity and reliability studies of the scale have been completed in Turkish sample. Factor analysis was

conducted with principal components and Kaiser Normalization according to varimax rotation. Items were loaded into three factors and this factor model was found to explain 80.6% of total variance. These factors have been identified based on their content. The first factor was named as “Aggression” which was explaining 30.6% of total variance; the second one is “Prosocial” explaining 27.9% of total variance; the third one is “Introversion” explaining 22.1% of total variance. According to findings, construct validity was found concordant with the original validation studies.

Internal reliability of the scale has been confirmed also. Internal reliability Cronbach alphas were found as 0.93 for aggressive subscale, 0.86 for prosocial subscale, 0.63 for Introversion subscale. The percentage of inter coder reliability was found around 90%.

## 2.2. Procedure

The present study was designed to collect descriptive data by using non-participant observation method. Observations in Turkey were conducted by Turkish researchers who were psychologists experienced in preschool education one of whom has Ph.D. degree in clinical psychology and the other one has also Ph.D. degree in developmental psychology. On the other hand in Belgium, children were observed by one of the Turkish researchers and also experienced Flemish educator in preschool teaching. Before starting observation process, researchers agreed on what should be defined under the title of aggression, prosocial, withdrawn behaviors considering DECB rating scale. Turkish preschool children were observed then Flemish observations were completed. Before the observation sessions started, the head and the teachers of participant preschoolers was briefly informed about the process and the duration of the study by the researchers. Observations were accomplished in free play time of Turkish preschoolers only for an hour in their daily activities because of more didactic and structured curriculum in Turkish preschools compared to Flemish preschools. In Turkish preschool education the curriculum has been shaped by recent educational approaches emphasizing active participation of children in learning process via multiple intelligences and project approach. On the other hand in Flemish preschools more extended flexible, innovative, child initiated curriculum was implemented based on Experiential Education Approach. In this approach preschool children were led to select activities supporting innovative learning based on their interests. Therefore it could be possible to observe Flemish preschool children because of plenty of time in their free choice activities. Children in both groups were observed in their free play time in order to recognize their behavior patterns and interactions in their natural settings. For this reason teachers were asked to let children to be free in classroom setting as much as possible. At the beginning of observation the researchers were introduced to children to whom it was told that their plays would be observed during that time. Observations took 15 minutes for each child, 10 minutes for observing, 5 minutes for coding by using Drexel Early Childhood Behavior Rating Scale (DECB). Every child was observed twice at different times to follow possible alternative changes in their interaction styles.

## 3. Findings

In the direction of main goal of the present study, the independent samples *t* test was conducted to examine if there was any differences between the two groups in terms of DECB Rating Scale which covers three behavioral dimensions; aggression, prosocial, and introversion. As it is shown in **Table 1**, there was only significant difference in prosocial dimension of DECB Rating Scale ( $t(51) = -3.905, p < 0.01$ ). In aggression and introversion

**Table 1.** The independent samples *t*-test comparing Turkish and Flemish preschooler’s DECB rating scale—behavior subscales.

DECB Rating Scale—Behavior Subscales	Country	N	$\bar{X}$	SD	df	T	<i>p</i>
DECB Aggression	Turkey	27	11.70	5.81	51	1.410	0.165
	Belgium	26	9.65	4.74			
DECB Prosocial	Turkey	27	14.77	1.87	51	-3.905	0.000*
	Belgium	26	17.15	2.53			
DECB Introversion	Turkey	27	11.29	5.18	51	-0.322	0.749
	Belgium	26	11.69	3.67			

dimensions, it was not found any significant difference between the two groups ( $t(51) = 1.410, p > 0.05$ ,  $t(51) = -0.322, p > 0.05$ ). However the mean scores of Flemish preschoolers in aggression dimension of the scale were found less than Turkish preschoolers. This finding will be discussed later based on educational framework in both of the countries.

#### 4. Discussion

In the present study, it was evaluated that if there would be differences between Turkish and Flemish preschool children in terms of behavioral subscales of DECB rating scale. As it was hypothesized Flemish preschool children were found better than Turkish peers in terms of prosocial behaviors although the mean scores of Flemish preschoolers were higher than Turkish preschoolers. Additionally, both of the groups were not differed significantly considering introversion dimension. However it was unexpected to find that there was no significant difference between the two groups related to aggression dimension of the scale.

As it was previously mentioned, promoting prosocial dimension of behaviors has been seen as a universal treatment in keeping well-being of children. Therefore the findings of the present study can be supported by this point of view. In this study the finding that revealed more prosocial behaviors of Flemish preschoolers could be interpreted as parallel to the approach specified above. Promoting prosocial behaviors could be seen the starting point for decreasing frequency of maladaptive behaviors. In order to achieve this goal, there are lots of issues that should be considered. One of those is the classroom settings and also educational framework that has been displayed for children in the class.

Preschool teachers can arrange classroom, routines and schedules that provide important opportunities for creating supportive environments. It has been suggested that whole classroom should be divided into small and well-defined corners to achieve effective and innovative learning areas so that it would be possible to keep children's attention based on their preferences. It is also critical to design clear paths to control chaotic settings and also to use simple system to limit the number of children at one time in any corner. Providing lots of toys and educational materials would prevent conflicts to encourage cooperation by exploring and expressing feelings (Denham & Burton, 2003). The physical environment which includes well-designed learning centers, traffic paths within the classroom and sufficient number of materials and equipment would foster positive and creative interactions among children. In other words, classroom schedules, routines and activities provide valuable tools for preventing problems by providing comfortable spaces for children to spent enjoyable time (Powell, Dunlap, & Fox, 2006).

Those were all the reasons why it has been found that there was a significant difference between Turkish and Flemish preschoolers. Since the classroom settings in Turkish preschools have usually been designed by limited opportunities, it is likely to occur conflictual situations. Compared to Flemish preschools, the learning corners have not been divided into effective and small areas based on children's interests in Turkish preschool classrooms. In addition to this, it cannot be assumed that sufficient number and variety of materials could be provided for children. Although it has been conducted a child-centered approach, most of the time teachers seem to give direct guidance whatever has gone at the moment. However, in Belgium, most of the time the child initiated activities have been carried out considering children's interests and competencies. On the contrary, in Turkish preschools, teachers usually have suggestions for activities by using direct instruction instead of supporting children to explore different kinds of learning opportunities.

Planned and scheduled daily routines would be helpful for children to let them to feel comfortable by removing uncertainty. Moreover it is possible to change activities before children get bored. This kind of planned activities and arrangements would decrease the occurrence of misbehaviors of children by reducing waiting times and changing activities when boredom signals emerge (Denham & Burton, 2003). In other words, developing clear and positive classroom rules and predictable schedules and routines by discussing those with children would make possible to create peaceful classroom settings (Webster-Stratton & Reid, 2008). This kind of classroom arrangements is more clearly conducted in Flemish preschools compared to Turkish preschools. Children regularly have daily routines; starts with greetings, sharing experiences and emotions then continues with discovering various learning areas by focusing on enriched environment contributing to their positive emotion and behaviors. By this way, they can effectively utilize their cognitive emotional and behavioral resources to learn and to develop themselves (Denham & Burton, 2003).

Although all young children have capacity to benefit from social and emotional foundations of learning, there is a need for universal programming with individualization which is the essential element of such a view (Den-

ham & Burton, 2003). In this process, it could be possible to achieve interactive education both to improve academic skills and also socio-emotional framework of children by organizing flexible classroom environment.

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# Adoption of Innovation within Universities: Proposing and Testing an Initial Model

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## Abstract

This study discusses the need for improvement and innovation in universities so they can effectively serve students and stay ahead in competition. Many technologies and innovations are already being used in universities. However, in order to diffuse or spread technologies or innovations effectively, it is important to understand the reasons leading to the adoption of technologies and innovations in universities. Based on a number of established theories and models on innovation and technology adoption and acceptance, this study proposes a theoretical model that helps explain the factors responsible for innovation adoption within universities. Measures for the study were adopted from previous studies, and an online questionnaire was used. Exploratory and confirmatory factor analyses were used to test and better understand the underlying structure of the proposed model. Reliability and validity of the proposed model were also examined. The initially proposed model seems to help in explaining the adoption of innovations within universities and is of value to researchers when investigating adoption within universities.

## Keywords

Innovation Adoption, Innovation, Higher Education, Technology Adoption

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## 1. Introduction

### 1.1. Innovation in Higher Education

Universities within the United Kingdom are facing many issues and challenges including the demands for accountability, conflicting demands of teaching and research, budget cuts, rapidly changing environment, advancements in technology, and many more. These issues and challenges have impacted the staff members' ability to develop, improve and innovate and have thus restricted innovation within universities (Hariri & Roberts, 2014).



A considerable amount of time has passed since the beginning of advances in information technology, particularly, the diffusion and widespread use of Internet around the world. This has certainly facilitated the diffusion of web-based approaches to learning (Rogers, 2003). Nevertheless, the benefits realised from adopting, integrating, and using technologies to enhance learning are still minimal, and there has yet to be substantial improvement in teaching (Miller, Martineau, & Clark, 2000; Zemsky & Massy, 2004; Lonn & Teasley, 2009; Nachmias & Ram, 2009; Soffer, Nachmias, & Ram 2010). According to Miller et al. (2000), technology seems to be least diffused and less common in a classroom. Currently, personal computers, projectors, and other technologies are being used, but are these the only innovations that can be used to enhance learning? Is it really possible that the technology-loving students are learning effectively from the instruction methods that have been used for tens or hundreds of years? This is quite hard to believe. More innovative approaches and technologies are required that can increase the quality of education. However, if such approaches exist, how can they be diffused across different departments or universities? According to Soffer, Nachmias, & Ram (2010), the diffusion of innovations within universities does not necessarily mean their successful adoption and significant impact on learning.

While the use of various innovations and technologies may help universities improve their services, but they might not guarantee their adoption by the staff members.

## 1.2. Adoption of Innovations

Innovation adoption is not granted. The assumption that the creation of technology would lead to its adoption is false (Zemsky & Massy, 2004). Providing or enabling the use of technologies (or innovations) is not sufficient to realise their benefits. The adoption and diffusion of innovations (including technologies) is a complex process that differs across groups of people and organisations (Rogers, 2003).

Innovations and technologies disappear if not adopted (i.e. diffused). Thus, the process of getting individuals (e.g. staff members or students) to adopt and use these innovations or technologies (Rogers, 2003; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2005) is equally important.

Various factors influence the adoption of innovations such as characteristics of the innovation, environment, and the adopter. Different theories and models have sought to help explain the adoption behaviour in various settings (Davis, 1989; Moore & Benbasat, 1991; Dooley, 1999; Karahanna, Straub, & Chervany, 1999; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003).

The ability to evaluate the success of various technologies and innovations used in universities depends largely on the number of adopters and how well they use technologies and innovations. Staff members need to buy-in to the use of technologies or innovations to enhance learning. Similarly, students may need to understand how such technologies would enable them to learn prior to deciding whether they should adopt and use them, if adoption of technologies was not mandated. For example, the success of online or distance education is heavily reliant on the faculty's engagement and participation (Tabata & Johnsrud, 2008).

Understanding the factors responsible for the adoption of technologies or innovations within universities is necessary for their adoption and use that may enhance learning. However, a lack of such understanding can result in the failure of such adoptions (Zemsky & Massy, 2004).

## 1.3. Model for Innovation Adoption in Higher Education

The model of Unified Theory of Acceptance and Use of Technology (UTAUT) aims to integrate and validate many previous theories and models such as the theory of reasoned action (TRA), theory of planned behaviour (TPB), and technology acceptance model (TAM), etc. (Figure 1). Testing the UTAUT model in different organisational settings has accounted for seventy per cent of the variance in the intention to use (Venkatesh, Morris, Davis, & Davis, 2003). This model is considered to be one of the best models for explaining the adoption or acceptance of technology (Jong & Wang, 2009). Many others have used the UTAUT and have reported that it is adequately robust (e.g. El-Gayar & Moran, 2006; Oshlyansky, Cairns, & Thimbleby, 2007; Gogus, Nistor, & Lerche, 2012).

Till date, the UTAUT model within an education or higher education context has been validated outside the UK (Jong & Wang, 2009; Yamin & Lee, 2010; Marques, Villate, & Carvalho, 2011; Gogus, Nistor, & Lerche, 2012; Oye, Iahad, & Rahim, 2012). Furthermore, most of these studies have used students as participants (e.g.



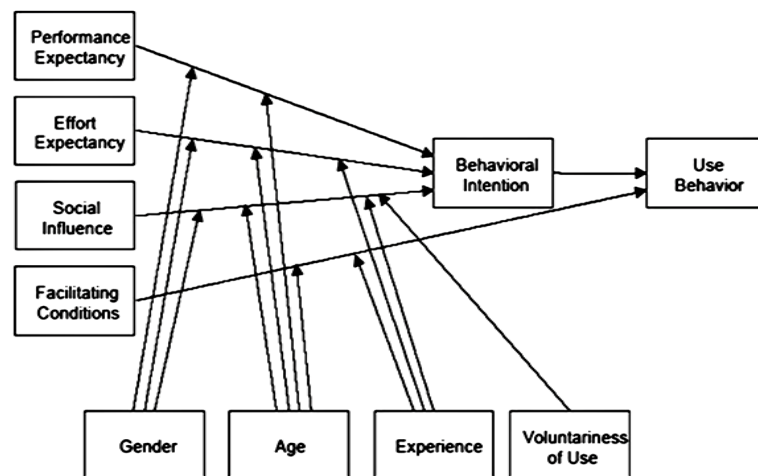


Figure 1. The Unified Theory of Acceptance and Use of Technology (UTAUT).

El-Gayar & Moran, 2006; Jong & Wang, 2009; Sumak, Polancic, & Hericko, 2010; Yamin & Lee, 2010; Hsu, 2012; Lakhal, Khechine, & Pascot, 2013). Thus, there is a need to understand and validate this model from the teacher's perspective. Therefore, our study will focus on the academic staff members of UK universities. Despite the UTAUT being a robust model that can explain technology or innovation adoption, it was not developed to explain the adoption within the education context. For instance, important factors that potentially influence the innovation adoption within universities, such as students' requirements, expectations and learning, were not investigated earlier.

Although the UTAUT integrated and tested many factors that influence innovation adoption, it failed to capture other important constructs supported by innovation adoption literature such as reinvention, results demonstrability, and trialability (Moore & Benbasat, 1991; Karahanna, Straub, & Chervany, 1999; Wejnert, 2002; Rogers, 2003; Suoranta, 2003; Odumeru, 2013).

Moreover, it has been a norm in the technology adoption and acceptance field to test the UTAUT or similar models using a single innovation or technology use (e.g. use of an e-mail client, e-learning system, etc.). These attempts of validating such theories or models may introduce unwanted effects. Moreover, Tornatzky & Klein (1982) recommended researchers to look at multiple innovation characteristics that allow for a better understanding of predictive power and any inter-relationships.

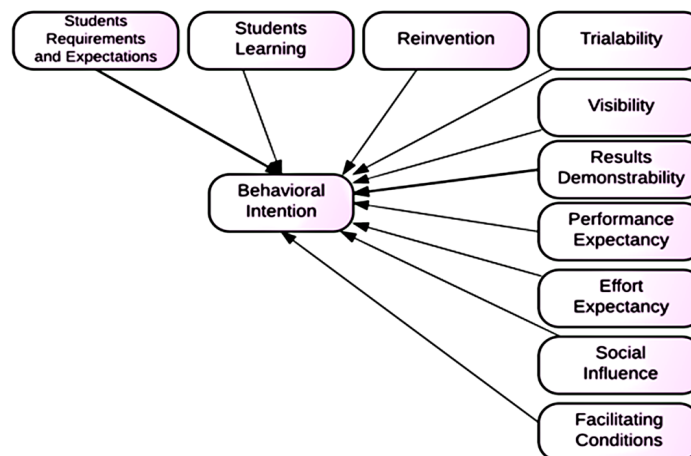
The theoretical model of our study may help to understand innovation adoption within UK universities and will be based on the UTAUT (Venkatesh, Morris, Davis, & Davis, 2003) and the diffusion of innovation theory (Moore & Benbasat, 1991; Rogers, 2003). Additionally, as suggested by Tornatzky & Klein, (1982), this study will investigate the adoption of different innovations, rather than a single innovation or technology, to reduce any unwanted moderating effects and to test the predictive power of the model.

The proposed model postulates ten constructs (Figure 2) that influence the intention and use of innovations. Literature support is given for the constructs themselves or any factors that they incorporated. For instance, perceived ease of use was incorporated into the effort expectancy construct.

Performance expectancy is the adopter's perception of how the adopted innovation will help in achieving better job performance. This is similar to the relative advantage attribute (Rogers, 2003). Effort expectancy is the perception of the ease of using an innovation. Social influence is the degree to which peers influence the use of an innovation. Facilitating conditions is the perception of the proper support provided to help in using the innovation. Finally, behavioural intention is the readiness to use the innovation. The higher the intention to perform something (such as using an innovation), the more likely it would take place (Ajzen, 1991; Table 1).

In addition to the above constructs, the following constructs were postulated to influence the intention to use an innovation: results demonstrability, visibility, trialability, and reinvention. Some of these proposed constructs have been empirically tested in the literature.

Results demonstrability is the visibility of the results of using the innovation. Visibility of the innovation, while very close to the previous construct, is concerned with how visible is the innovation to others. Trialability is the ability to experiment with the innovation before its full adoption and use. Reinvention is the degree to



**Figure 2.** Proposed model for innovation adoption in UK universities.

**Table 1.** Main constructs.

Construct	Literature support
Performance expectancy	Davis, 1989; Venkatesh & Davis, 2000; Greenhalgh, 2005; Rogers, 2003; Venkatesh et al., 2003; Kijnsanayotin et al., 2009; Sumak et al., 2010; Lakhal et al., 2013
Effort expectancy	Davis, 1989; Moore & Benbasat, 1991; Thompson et al., 1991; Kijnsanayotin et al., 2009; Oye et al., 2012
Social influence	Jacobsen, 1998; Sheppard et al., 1988; Ajzen, 1991; Venkatesh & Davis, 2000; Rogers, 2003; Venkatesh et al., 2003; Kijnsanayotin et al., 2009; Sumak et al., 2010; Lakhal et al., 2013
Facilitating conditions	Jong & Wang, 2009; Lakhal et al., 2013

which an innovation can be adapted, changed, or modified to suit the circumstances of the adopter or user.

In addition to the above constructs that have been discussed and tested directly or indirectly (e.g. using similar constructs) in previous studies, we have proposed two new constructs: students' requirements and expectations, and students' learning.

Students' requirements and expectations are expected to influence the staff members' decision to adopt or use innovation. Such adoption decision should ideally take into consideration the students' requirements and expectations in order to meet or exceed them. Similarly, students' learning should be something that universities should strive to improve continuously. Therefore, the adoption decision should also take into consideration the degree to which the innovations can help improve students' learning (Table 2).

In the next section, the study focuses on data collection so as to test the proposed model.

## 2. Methods

Based on a number of innovation and technology adoption theories and models (e.g. Davis, 1985; Davis, Bagozzi, & Warshaw, 1989; Venkatesh, Morris, Davis, & Davis, 2003; El-Gayar & Moran, 2006; Oshlyansky, Cairns, & Thimbleby, 2007), this study aims to propose and validate a theoretical model that may help explain innovation adoption within UK universities. Moreover, the two newly proposed constructs, along with the previously studied constructs, will be tested in our study.

Data collected were aggregated and pooled across different innovations/technologies and organisations. Such aggregation is consistent with previous research (e.g. Compeau & Higgins, 1995; Venkatesh & Davis, 1996; Nistor, Wagner, Istvanffy, & Dragota, 2010). Thus, any influence that may result from testing the model against a single innovation or technology can be minimised. Furthermore, it allows for a better understanding of its suitability and helps explain its adoption across multiple innovations.

In line with previous studies (e.g. Davis, 1985; Moore & Benbasat, 1991; Venkatesh, Morris, Davis, & Davis, 2003; Kijnsanayotin, Pannarunothai, & Speedie, 2009), an online questionnaire instrument survey approach was used because of its easy and low-cost distribution among the staff members. Currently, most university staff members have and are expected to use their emails.

**Table 2.** Additional constructs.

Construct	Literature support
Results demonstrability	Moore & Benbasat, 1991; Agarwal & Prasad, 1997
Visibility	Rogers, 2003; Wejnert, 2002
Trialability	Rogers, 2003; Suoranta, 2003; Odumeru, 2013
Reinvention	Rogers, 2003
Students' requirements and expectations	Proposed by our study
Students' learning	Proposed by our study

Different measures were adopted from various studies (most notably Moore & Benbasat, 1991; Venkatesh, Morris, Davis, & Davis, 2003) and modified to suit the present context. These measures are presented in **Appendix 1**.

This model was first validated within the University of Warwick, UK. Following previous research (Bryman, 2008; Cohen, Manion, & Morrison, 2011), the survey questionnaire was pilot-tested within the university on 25 staff members that were selected from a population of over 130 staff members. Minor adjustments were made to the questions used. The reliability testing of the analysed data proved it to be reliable. Then, the researchers proceeded to the next phase.

Over 17,754 staff members from 27 UK universities were invited to participate in our study. Considering the busy schedules of the staff members, we had expected a low response rate and had thus drawn a large sample. We received a total of 499 responses. The data obtained were then screened, and those with missing values and un-engaged responses (e.g. those answering the same choice for all questions) were removed. Finally, we obtained 497 responses that were used to validate the proposed model.

## 2.1. Demographics

Of the total respondents, 61% were males and the remaining 38% were females. The majority of the respondents were aged between 30 to 50 years (59%), followed by those aged over 50 years (39%) and finally, those under 30 years (1.8%). In terms of work experience, 63% respondents had over 9 years, 21% had 5 to 9 years and 15% had less than 5 years of experience. In terms of educational level, 77% respondents had a doctorate degree, 19% had a master's degree and 8% had other qualifications.

Upon the successful collection of the data, the exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed to study the underlying relationships in the model and to test its reliability and validity.

## 2.2. Exploratory Factor Analysis

EFA is helpful in investigating the underlying structures based on correlation between different factors (Brace, Kemp, & Snelgar, 2012). Using the SPSS software package, an EFA was carried out using the maximum likelihood extraction method and a Promax rotation method (Hair, Black, Babin, & Anderson, 2010; Brace, Kemp, & Snelgar, 2012). The former method is appropriate and consistent with the next stage of the analysis, which uses the same technique.

## 2.3. Confirmatory Factor Analysis

The assessment of the CFA measurement model helps in reaching a better understanding of how well the measurement items reflect the latent variables (Byrne, 2010). Moreover, while doing a CFA, the validity and reliability of various factors can be examined as well.

CFA can be used in an exploratory or confirmatory way (Byrne, 2010). When used in an exploratory way, the goal is usually to confirm predefined relationships. On the other hand, if there are no predefined relationships or if the initial model was rejected by the researcher, CFA can be used to explore and test various effects (Byrne, 2010).

### 3. Results

The results of EFA and CFA are presented below.

#### 3.1. Exploratory Factor Analysis (EFA)

A total of 11 factors were analysed using EFA, and the results of the analyses are presented in [Appendix 2](#).

After the initial assessment and the removal of low loading and non-loading factors ([Hair, Black, Babin, & Anderson 2010](#)), the resulting model had a Kaiser-Meyer-Olkin (KMO) value of 0.824, which is above the acceptable value of 0.7. Commonalities for all the variables were sufficiently high (above 0.500). The adequacy of all the variables and the model were also confirmed as the reproduced matrix had only 2% non-redundant residuals that were greater than 0.05. The total variance explained by the tested model was 65%, which is considered significant.

With respect to factor loadings, the items related to social influence were found loading on two different factors: social influence and image. The social influence construct integrated many similar concepts ([Venkatesh, Morris, Davis, & Davis, 2003](#)) including subjective norms, social factors, and image. Some researchers also warned that social influence should not be looked at as a single construct ([Martins & Kellermanns, 2004; Lakhali, Khechine, & Pascot, 2013](#)).

Moreover, trialability was found to have high loading with facilitating conditions. This may be because individuals felt that they were free to test innovations before using it. This perception is close to the definition given for facilitating conditions (see [Venkatesh, Morris, Davis, & Davis, 2003](#)) since individuals would feel less constrained and free to test innovations if proper facilitating conditions were in place.

One single Heywood case was found as PE\_3's estimate was higher than 1. This was considered to avoid further issues in the subsequent stage.

#### Reliability and Validity

To ensure minimum measurement error, the properties of the measures used in the study should be investigated to gain confidence over their effectiveness ([Field, 2009](#)).

Cronbach's alpha values were calculated and investigated (see [Appendix 2](#)). All values were well above the 0.7 cut-off point.

In this study, two types of construct validity were investigated: convergent and discriminant validities. Convergent validity examines the degree to which the items that theoretically belong to a single construct correlate. Discriminant validity examines the degree to which items or the measures of a scale do not measure with other constructs.

From the pattern matrix produced ([Appendix 2](#)), it can be seen that all the constructs have shown high convergent validity, i.e. above the 0.350 threshold ([Hair, Black, Babin, & Anderson, 2010](#)). Moreover, despite T loading on two factors, its loading with FC is high, indicating that they are highly related. Furthermore, since the researchers had considered social influence as two different constructs, social influence and image, the investigating factor loadings for items related to both the constructs show high convergent validity.

Discriminant validity of the model is also shown since measures belonging to each factor were not loading on other factors simultaneously. However, one exception is the cross loading of T. Additionally, investigating the factor correlation matrix ([Appendix 2](#)) shows no correlations higher than 0.7 between any of the constructs, which confirmed the discriminant validity of all the constructs.

#### 3.2. Confirmatory Factor Analysis (CFA)

Using the results of the previous EFA stage, the CFA measurement model was developed and assessed.

Based on experts' recommendations (e.g. [Byrne, 2010; Hair, Black, Babin, & Anderson, 2010](#)) and by following a number of iterations to explore and attempt to improve model fit, the following CFA model ([Figure 3](#)) was considered good as it fits the data adequately. As can be seen in [Table 3](#), the goodness of fit (GOF) indices of the model indicate a good model fit.

#### Reliability and Validity

Although the reliability and validity of the proposed model was performed in the previous EFA stage, it is important to re-examine them because of the changes (e.g. addition and removal of items) introduced to the model

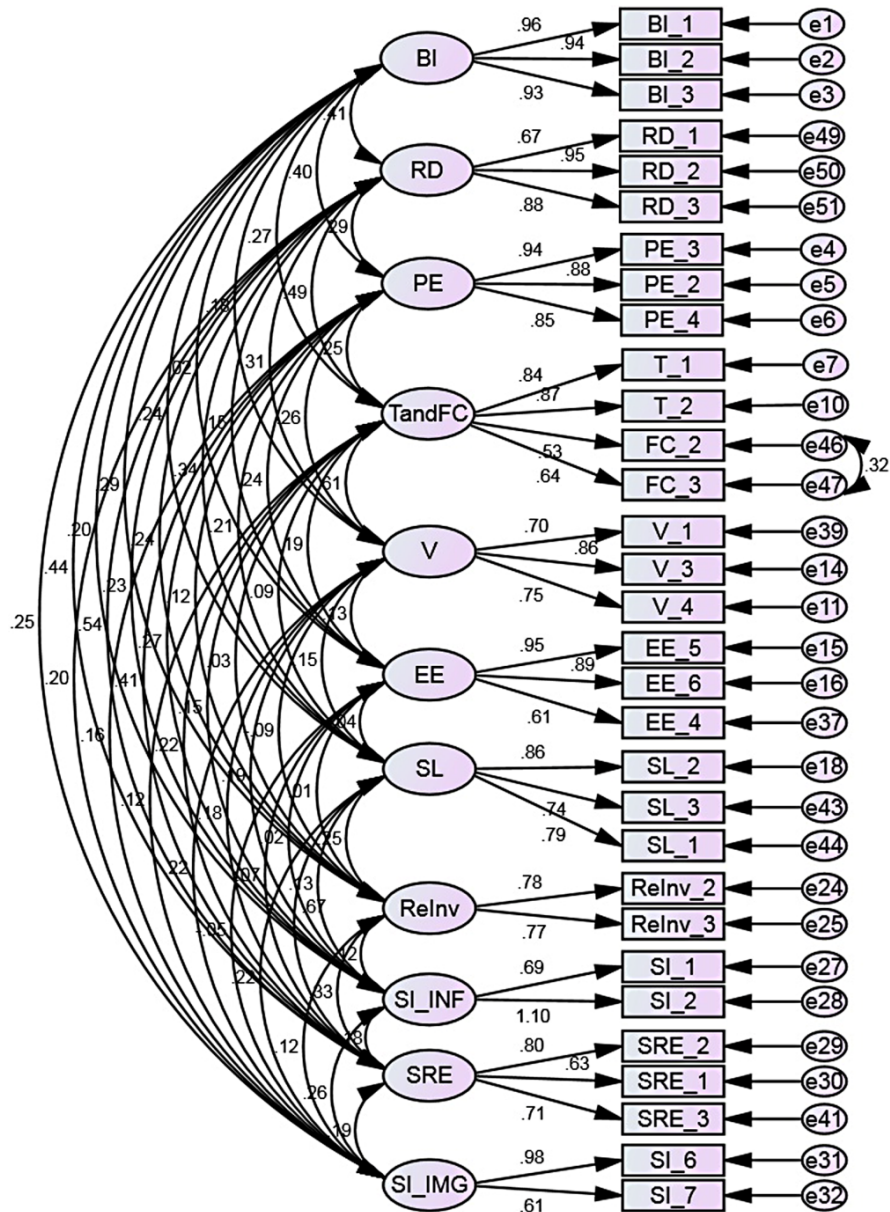


Figure 3. Confirmatory factor analysis.

Table 3. CFA\* goodness of fit indices.

Model-fit parameters	Obtained values	Recommended values (Hair, Black, Babin, & Anderson, 2010)
CMIND/DF:	2.566	Below 5. The less, the better.
GFI:	0.888	Between 0 - 1. Higher values indicate a good model fit. A value of 1 indicates perfect fit.
AGFI:	0.853	Between 0 - 1. Higher values indicate a good model fit and are recommended to be above 0.80.
CFI:	0.936	Between 0 - 1. Higher values close to 1 indicate a good model fit.
PCFI:	0.761	Recommended to be above 0.8.
PCLOSE:	0.010	Recommended to be above 0.05.
RMSEA:	0.056	Recommended to be less than 0.1. More better if less than 0.05.



and to ensure that the measurement errors were reduced. A high reliability is argued to be linked with lower measurement errors (Hair, Black, Babin, & Anderson, 2010). Furthermore, to reflect latent factors appropriately, observed variables need to show the evidence of reliability and validity (Straub, Boudreau, & Gefen, 2004; Schumacker & Lomax, 2010).

Using the validity testing tool within the “Stats Tools Package” (Gaskin, 2012) and by imputing AMOS’s correlations and standardised regression tables into the tool, the reliability and validity testing results were calculated. These are shown in [Appendix 3](#). The following points have been highlighted:

- **CR** (Composite reliability): It measures the reliability of the factors and should ideally be above 0.75.
- **AVE** (Average Variance Extracted): This is a measure of convergent validity and should be above 0.5 (Hair, Black, Babin, & Anderson, 2010). It indicates how well the items explain the factor. It is shown diagonally in bold.
- **MSV** (Maximum Shared Squared Variance): The MSV between the factor and the other factors in the model indicates how well is the factor explained by items outside the factor (i.e. items of other constructs).
- **ASV** (Average shared squared variance): It is similar to MSV, but takes the average of the squared variances. It indicates how much on an average is explained by items of other factors.
- **AVE** (Average variance extracted): It should always be higher than MSV and ASV. The items belonging to the factor itself should better explain it than the items belonging to other factors (Straub, Boudreau, & Gefen, 2004).

From the table in [Appendix 3](#) and [Appendix 4](#), we can see that all constructs have high CR values. The high (above 0.50) AVE values indicate a good convergent validity. Discriminant validity can be assessed by comparing the square root of the AVE for each construct (the diagonal in bold) to all inter-factor correlations (below the values in bold). All factors reveal adequate discriminant validity because all diagonal values (square root of AVE) are greater than the correlations. Therefore, we conclude that adequate reliability and construct validity have been established.

### 3.3. Common Method Bias or Variance

Common method bias remains a threat to validity in certain research fields. Despite the majority of information systems (IS) research using a single data collection method, only few studies have reported it (Straub, Boudreau, & Gefen, 2004).

Our study investigated whether the use of common factor method was an issue because the method was considered to be relevant for studies that do not measure a common factor explicitly (MacKenzie & Podsakoff, 2012). Addition of the common method factor indicated certain common method bias issues in some of the factors. This was also reflected in the reliability and validity tests that were run with the common method factor.

In this study, common method bias might have affected some items because certain questions could have influenced the respondent’s responses to the next item (Straub, Boudreau, & Gefen, 2004). Therefore, items or constructs that were impacted by this bias were dropped, and minor adjustments were made to the mode, which resulted in the following measurement model ([Figure 4](#)).

There was an error variance e31, which had to be set, instead of being freely estimated as it would have otherwise caused the regression weight for the SI\_6 item to be above 1.

### 3.4. Invariance Testing

When carrying out research that spans across different groups (i.e. different countries, universities, etc.), it is vital to be conscious of and reduce any bias that may have resulted from the data collection method and/or respondents’ characteristics (Cohen, Manion, & Morrison, 2011). Hair, Black, Babin, & Anderson (2010) recommended establishing some form of metric-invariance before examining the path estimates, which is something future studies may decide to pursue when building on the well-established model presented in this study.

To assess and reduce such bias, measurement invariance across different groups (e.g. gender, age, experience, etc.) should be assessed. If testing the model across different groups shows a good GOF for the model, it indicates a configurable invariance and that the groups are likely to be equivalent.

Using SPSS AMOS, the following groups were created using categorical (e.g. demographics) data captured in the survey to test the model across gender (male/female), age (30 - 50 years/over 50 years), education (MSc/doctorate), teaching hours per year (51 - 100, 501 - 1000 hours), experience (medium/high), and country (Eng-

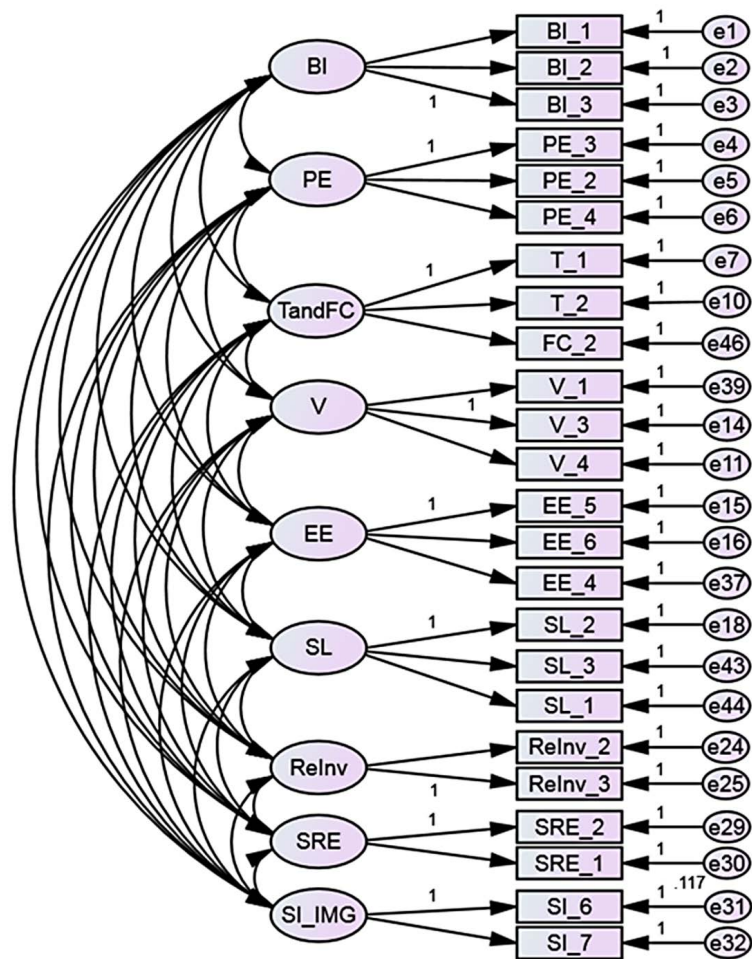


land/Scotland/Wales). The model fit summary is mentioned in [Table 4](#).

Based on the parameters reported above, we can say that the model is equivalent across different groups.

Moreover, using the Stats Tools Package ([Gaskin, 2012](#)), a chi-square test of difference was used to compare between degrees of freedom for the unconstrained and fully constrained models. For the fully constrained model, regression values were removed from the lines and variances for factors were restricted to 1. The output of the comparison is given in [Table 5](#).

As can be seen from the [Table 5](#), the p-value is not significant and is greater than [Byrne's \(2010\)](#) 0.05 cut-off indicating that there are no significant differences between the groups at the model level.



**Figure 4.** Final measurement model.

**Table 4.** Multigroup invariance testing model fit.

Model-fit parameters	Obtained values	Recommended values ( <a href="#">Hair, Black, Babin, &amp; Anderson, 2010</a> )
CMIND/DF:	1.587	Below 5. The less, the better.
P:	0.000	A larger sample causes P to be significant. Therefore, it was not taken into account. If the sample was small, a significant value here indicates a bad model fit.
CFI:	0.956	Between 0 - 1. Higher values close to 1 indicate a good model fit.
PCFI:	0.748	Recommended to be above 0.8.
PCLOSE:	1.000	Recommended to be above 0.05.
RMSEA:	0.014	Recommended to be less than 0.1. Better if less than 0.05.

**Table 5.** Invariance testing of the fully constrained and unconstrained model.

	Chi-square	df	<i>p</i> -value	Invariant?
Overall model				
Unconstrained	4514.773	2808		
Fully constrained	4809.096	3096		
Number of groups		13		
Difference	294.323	288	0.386	YES

#### 4. Discussion

Rapid changes have pressurised universities around the world to either improve or fall behind in an increasingly competitive race, where funding is scarce. Universities need to improve to accommodate the tech-addicted students. Various technologies and innovations ranging from the Internet, emails, learning management systems, and others have been implemented and are being used by staff members within universities. New knowledge is generated every second and due to the Internet, its delivery and distribution costs have become cheap, if not free. Traditional preaching-type teaching methods have become obsolete for today's knowledge creating and consuming societies.

Thus, the introduction of innovations and technologies is not enough. Staff members must be encouraged to adopt such innovations and technologies, which may help enhance learning.

Acknowledging the need to understand the factors that lead to the adoption of innovations within universities, this study hopes to develop a theoretical model that may help explain the factors responsible for innovation and technology adoption within universities. For this purpose, the study used existing measures and adapted them accordingly. More specifically, measures were adapted to capture information related to different innovations. Additionally, new measures were developed for a number of constructs that were investigated.

EFA and CFA were used to understand the underlying structure of the proposed model. Furthermore, many reliability and validity techniques were used, and the common method variance was examined. Lastly, configural invariance at the model level was established since the proposed model performed well after testing it against a number of groups that were defined based on demographic or categorical information. Based on the results gained so far, the proposed model was found to be of adequate fit to the collected data. Subsequent studies may focus on testing and on exploring various relationships in the model as well as any mediation and moderation effects.

Although the proposed model needs to undergo further testing, a number of contributions have been achieved so far. First, in addition to the UTAUT's constructs, a number of new constructs were proposed. EFA and CFA results indicate that the proposed model fits the data. Second, although changes were made to the UTAUT measures to capture information related to multiple innovations, these measures are still reliable and valid. Third, this study proposed two additional constructs that are believed to be important for the adoption of innovations within universities: students' learning, and students' requirements and expectations. New measures were developed for both constructs, which showed adequate reliability and validity. Future studies investigating the adoption of innovations within universities are likely to benefit from incorporating and using these measures or the whole model as a starting point. Further research is required towards a better understanding of the adoption of innovations within universities: to help diffuse innovations, technologies, or approaches that may enhance learning within our universities.

As is the case with any research, this work has a number of limitations. First, despite the researchers' intention to study a larger sample, the response rate of this study was low (Hariri & Roberts, 2014). As a result of this low response rate, it is not possible to generalise the findings of this study. Moreover, there is a possibility of the inherent bias where only staff members who had time or were interested in participating did so. Furthermore, the questions adopted by this research relied on personal opinions and perceptions as reported by the participants. Hence, responses may not reflect the accurate feelings and beliefs of the respondents. Rather than relying fully on self-administered questionnaires, forthcoming research may consider using another data collection method or a combination of methods such as observations, actions research, and/or collecting data at different periods of time. Moreover, certain technologies or methods may be used within the institutions to track and report usage of certain innovations adopted by staff members. The use of different data collection methods could help in under-

standing whether the nature of the widely used questionnaire instrument is influencing or causing problems in researching and understanding the adoption of innovations and technologies. Other data collection methods may be more accurate especially with respect to capturing actual adoption and use rather than self-reported information.

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## Appendices

### Appendix 1. Measures

#### Performance expectancy

- I would find that using a learning innovation is useful in my job
- Using a learning innovation would enable me to accomplish tasks more quickly
- Using a learning innovation would increase my productivity.
- Using a learning innovation would make it easier for me to do my job.

#### Effort expectancy

- Learning to use the learning innovation must be easy.
- I would find the learning innovation easy to use.
- The approach to use the learning innovation must be clear and understandable to me.
- It would be easy to become skilful at using a learning innovation.
- The use of the learning innovation does not take much effort.
- The use of the learning innovation does not require too much time.

#### Social influence

- People who influence my behaviour think that I should use the learning innovation.
- People who are important to me think that I should use the learning innovation.
- I would use the learning innovation because of the proportion of co-workers who use it.
- The senior management would be helpful in the use of the learning innovation.
- The organization has supported the use of the learning innovation.
- Using the learning innovation would improve my image within the organization.
- People in my organization who use the learning innovation have more prestige than those who do not.

#### Facilitating Conditions

- I have control over using any learning innovation I see fit.
- I have the resources necessary to use the learning innovation I see fit.
- I have the knowledge necessary to use the learning innovation I see fit.
- Guidance is available to me for the selection of the appropriate learning innovation that I could use.

#### Results demonstrability

- The results of using the learning innovation by myself or others are clear to me.
- I would have no difficulty in telling others about the results of the learning innovation I use.
- I believe I could communicate to others the consequences of using the learning innovation

#### Visibility

- I have seen what others are doing with the learning innovations they are using.
- Learning innovations are not very visible in my organization.
- It is easy for me to observe others using learning innovations in my organisation.
- Effective learning innovations in my organization are disseminated for others to learn from.

#### Trialability

- I've had a great deal of opportunities to try various learning innovations.
- I know exactly what I can do if I wanted to try out a learning innovation.
- The ability to try a learning innovation before using it is important to me.

**Continued**

- I am likely to use learning innovations that have been tested and proven effective by others in my area.
- I am likely to use learning innovations tested and proved to be effective by myself.

**Reinvention**

- It must be easy to change the learning innovation I would use to do what I want it to do.
- I am more inclined to use a learning innovation that I am able to change or adjust to suit my needs.
- I am more likely to adopt and use a learning innovation when I am actively involved in customizing it to fit my unique situation.

**Students' requirements and expectations**

- Before deciding to use a learning innovation, it must be clear how it can help me meet or exceed my students' expectations.
- Knowing about my students' requirements allows me to use an appropriate learning innovation.
- Using a learning innovation helps me meet or exceed my students' expectations.
- The choice of what learning innovation I use is not dependent on whether it can help me fulfil my students' requirements or not.

**Students' learning**

- Before deciding to use a learning innovation, it must be clear how it can improve students' learning.
- The learning innovation I use must help improve students' learning.
- Understanding how my students learn best will help me to use the appropriate learning innovation.
- I evaluate the learning innovation I use to ensure that it enhances my students' learning.

**Behavioural intention**

- I intend to use a learning innovation in the near future.
- I predict I would use a learning innovation in the near future.
- I plan to use a learning innovation in the near future.



**Appendix 2.** EFA results and reliability testing.

	Communalities <sup>*</sup>	
	Initial	Extraction
PE_2	0.730	0.714
PE_3	0.744	0.999
EE_2	0.488	0.375
EE_4	0.602	0.513
EE_5	0.768	0.889
EE_6	0.744	0.806
SI_1	0.669	0.815
SI_2	0.672	0.783
SI_3	0.333	0.318
SI_6	0.442	0.500
SI_7	0.406	0.796
FC_1	0.398	0.349
FC_2	0.533	0.521
FC_3	0.535	0.531
RD_1	0.564	0.550
RD_2	0.764	0.861
RD_3	0.740	0.821
V_1	0.469	0.511
V_3	0.584	0.749
V_4	0.499	0.565
T_1	0.634	0.653
T_2	0.643	0.668
ReInv_1	0.349	0.381
ReInv_2	0.520	0.764
ReInv_3	0.433	0.483
SRE_1	0.415	0.444
SRE_2	0.576	0.735
SRE_3	0.534	0.530
SL_1	0.576	0.625
SL_2	0.629	0.833
SL_3	0.587	0.599
SL_4	0.466	0.433
BI_1	0.875	0.925
BI_2	0.857	0.889
BI_3	0.838	0.868

Extraction Method: Maximum Likelihood. <sup>\*</sup>One or more communality estimates greater than 1 were encountered during iterations. The resulting solutions should be interpreted with caution.

## Total variance explained.

Factor	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings <sup>#</sup>
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total
1	7.829	22.368	22.368	3.463	9.893	9.893	4.809
2	3.401	9.717	32.085	4.508	12.881	22.774	4.497
3	2.627	7.507	39.592	2.955	8.443	31.218	3.025
4	2.547	7.276	46.868	2.147	6.133	37.351	3.856
5	2.206	6.303	53.170	2.372	6.778	44.129	3.708
6	1.713	4.895	58.066	2.349	6.711	50.840	5.223
7	1.424	4.070	62.135	1.368	3.908	54.749	2.350
8	1.347	3.848	65.984	1.148	3.281	58.029	2.290
9	1.179	3.367	69.351	0.960	2.744	60.773	3.620
10	1.108	3.165	72.516	0.885	2.528	63.302	4.032
11	0.933	2.666	75.183	0.640	1.828	65.129	2.153
12	0.710	2.029	77.212				
13	0.663	1.895	79.107				
14	0.642	1.835	80.942				
15	0.619	1.769	82.711				
16	0.605	1.729	84.441				
17	0.531	1.518	85.958				
18	0.483	1.379	87.337				
19	0.449	1.284	88.621				
20	0.420	1.200	89.821				
21	0.389	1.111	90.932				
22	0.378	1.080	92.013				
23	0.357	1.020	93.032				
24	0.342	0.978	94.010				
25	0.294	0.839	94.850				
26	0.277	0.792	95.642				
27	0.260	0.744	96.386				
28	0.244	0.697	97.083				
29	0.219	0.626	97.709				
30	0.192	0.548	98.257				
31	0.160	0.458	98.715				
32	0.134	0.383	99.098				
33	0.127	0.363	99.461				
34	0.107	0.307	99.768				
35	0.081	0.232	100.000				

Extraction Method: Maximum Likelihood. <sup>#</sup>When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Pattern matrix.

Cronbach's alpha	Factor										
	1	2	3	4	5	6	7	8	9	10	11
	<b>0.960</b>	<b>0.825</b>	<b>0.849</b>	<b>0.820</b>	<b>0.810</b>	<b>0.857</b>	<b>0.762</b>	<b>0.737</b>	<b>0.909</b>	<b>0.747</b>	<b>0.741</b>
BI_1	0.994										
BI_3	0.964										
BI_2	0.962										
FC_2		0.824									
FC_1		0.681									
T_2		0.669									
T_1		0.652									
FC_3		0.643									
EE_5			0.953								
EE_6			0.907								
EE_4			0.614								
EE_2			0.525								
SL_2				0.995							
SL_1				0.808							
SL_3				0.536							
SL_4				0.372							
V_3					0.900						
V_4					0.751						
V_1					0.698						
RD_3						0.993					
RD_2						0.981					
RD_1						0.507					
SI_1							0.901				
SI_2							0.872				
SI_3							0.424				
ReInv_2								0.880			
ReInv_3								0.666			
ReInv_1								0.601			
PE_3									1.029		
PE_2									0.826		
SRE_2										0.807	
SRE_1										0.647	
SRE_3										0.448	
SI_7											0.927
SI_6											0.618

Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization. a. Rotation converged in 7 iterations.

Factor correlation matrix.

Factor	1	2	3	4	5	6	7	8	9	10	11
1	1.000	0.313	0.087	0.292	0.227	0.502	0.158	0.294	0.411	0.398	0.216
2	0.313	1.000	0.240	0.162	0.535	0.550	0.029	0.030	0.294	0.204	0.085
3	0.087	0.240	1.000	0.078	0.184	0.201	0.068	0.081	0.267	0.116	0.010
4	0.292	0.162	0.078	1.000	0.171	0.393	0.026	0.231	0.242	0.589	0.213
5	0.227	0.535	0.184	0.171	1.000	0.354	0.200	−0.043	0.261	0.118	0.237
6	0.502	0.550	0.201	0.393	0.354	1.000	0.073	0.221	0.355	0.449	0.187
7	0.158	0.029	0.068	0.026	0.200	0.073	1.000	0.065	0.235	0.143	0.365
8	0.294	0.030	0.081	0.231	−0.043	0.221	0.065	1.000	0.089	0.247	0.079
9	0.411	0.294	0.267	0.242	0.261	0.355	0.235	0.089	1.000	0.372	0.186
10	0.398	0.204	0.116	0.589	0.118	0.449	0.143	0.247	0.372	1.000	0.201
11	0.216	0.085	0.010	0.213	0.237	0.187	0.365	0.079	0.186	0.201	1.000

Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization.

Appendix 3. Reliability and validity testing of the measurement model.

	CR	AVE	MSV	ASV	SI_IMG	BI	PE	T and FC	V	EE	SL	ReInv	SI_INF	SRE	RD
SI_IMG	0.785	0.658	0.069	0.037	0.811										
BI	0.961	0.891	0.194	0.087	0.248	0.944									
PE	0.921	0.796	0.164	0.076	0.165	0.400	0.892								
T and FC	0.816	0.535	0.378	0.088	0.119	0.269	0.247	0.731							
V	0.815	0.597	0.378	0.074	0.224	0.185	0.261	0.615	0.772						
EE	0.868	0.694	0.060	0.014	−0.050	0.024	0.244	0.189	0.128	0.833					
SL	0.841	0.639	0.448	0.082	0.218	0.243	0.210	0.090	0.146	0.038	0.799				
ReInv	0.752	0.603	0.109	0.037	0.121	0.289	0.124	0.030	−0.089	0.006	0.252	0.777			
SI_INF	0.912	0.844	0.075	0.036	0.262	0.196	0.273	0.151	0.190	0.021	0.131	0.123	0.919		
SRE	0.760	0.516	0.448	0.136	0.193	0.441	0.405	0.215	0.185	0.066	0.669	0.330	0.176	0.718	
RD	0.875	0.705	0.291	0.117	0.205	0.407	0.295	0.492	0.309	0.150	0.338	0.243	0.233	0.539	0.840

No Validity Concerns.

Appendix 4. Reliability and validity testing of the final measurement model.

	CR	AVE	MSV	ASV	SRE	BI	PE	T and FC	V	EE	SL	ReInv	SI_IMG
SRE	0.733	0.584	0.442	0.104	0.764								
BI	0.960	0.890	0.160	0.072	0.338	0.943							
PE	0.921	0.795	0.160	0.068	0.329	0.400	0.892						
T and FC	0.800	0.582	0.387	0.073	0.153	0.249	0.240	0.763					
V	0.815	0.597	0.387	0.077	0.161	0.185	0.261	0.622	0.772				
EE	0.868	0.693	0.059	0.013	0.045	0.023	0.242	0.162	0.127	0.832			
SL	0.841	0.638	0.442	0.086	0.665	0.244	0.211	0.084	0.146	0.038	0.799		
ReInv	0.752	0.603	0.095	0.035	0.309	0.289	0.124	0.018	−0.089	0.007	0.253	0.777	
SI_IMG	0.781	0.652	0.063	0.031	0.145	0.250	0.167	0.133	0.227	−0.051	0.221	0.121	0.808

No Validity Concerns.

# Self-Efficacy Scale of Pre-School Teachers towards Mathematics Education in Pre-School Period

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## Abstract

The study aims to develop an assessment instrument oriented to assess the self-efficacies of pre-school teachers towards mathematics education. The assessment instrument was applied to 255 pre-school teachers working in Yenimahalle county of Ankara province in the 2012-2013 academic year. It was found out that the first factor of “Self-Efficacy of Pre-School Teachers towards Mathematics Education” explained 46.597% of the total variance, and the second factor explained 9.035% of the total variance. In this sense, the total variance that the scale, and thus the construct validity of the scale was acceptable. The reliability co-efficient of the first factor of the scale is 0.951; the reliability co-efficient if the second factor is 0.951; and the total reliability co-efficient is 0.967.

## Keywords

Pre-School Education, Early Mathematics Education, Pre-School Teacher

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## 1. Introduction

Mathematics can appear in individuals’ lives in every stage of life. Accordingly, today, mathematics education has an important place in the education process of children. Children’s developing positive attitude towards Mathematics is closely related to the education they take in the early years of their lives and to the guidance of the pre-school teachers that they meet (Akman, 2002).

In the studies conducted on the quality of education in pre-school period, one of the most emphasized issues is the teacher-student communication. In order to give a quality education, the teacher must have an adaptive, creative, investigative, and flexible characteristic (Kandır, İnal, & Özbey, 2010).

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For the teachers, being ready for the mathematics education is crucial and occasionally difficult situation. Generally, to teach mathematics, one must have a strong mathematic and pedagogic background. National Council of Teachers of Mathematics (NCTM), in its *Professional Standards for Teaching Mathematics* (1991), emphasizes that “the teacher must endeavor to make the concepts and principles of mathematics deeply understood and to provide that the subjects of mathematics or its relations with other disciplines are formed”. In pre-school period, which is outstanding in raising the individuals and accepted as a critical period in one’s life, laying the foundations of the academic skills, especially mathematics skills, is essential. Therefore, as it is well known, the person who will support the developing of these skills in those years is the pre-school teacher who is taken as a role model after the child’s parents. It is thought that the ideas, beliefs and self-efficacy beliefs of the pre-school teachers on mathematics education affect the implementations in the education process (Şeker, 2013).

People have many self-efficacy perceptions that they need to show in their daily lives. “*Self-efficacy*” is one of the key concepts of Albert Bandura’s Social Learning Theory that has been the topic of many studies in recent years. According to Bandura (1997), self-efficacy is an effective quality in the forming of the behaviours and is defined as “the self attitude of the individuals related to their capacity to organize necessary activities to perform well and to succeed” (Şahin, Ogelman, & Ekici, 2011).

The gaining of the necessary attitude, behavior, knowledge and skills requires teacher training programs to include general culture, field information, and professional knowledge. It is a well known fact that teachers must have the field information about the subject that they teach. In addition to the field information, the teacher must have skills and techniques related to that occupation in order to perform their job (Celep, 2005). The pre-school teachers are expected to have high levels of self-efficacy as well as having professional knowledge and skills.

According to Bandura, the important thing is the judgments of the people towards performing a behavior successfully or not, because, those judgments will definitely lead to some results. In other words, as those who have high self-efficacy will be able to get the results that they want, their expectations for the results will be shaped accordingly (Akbaş & Çelikkaleli, 2006).

Bandura (1986) emphasized self-efficacy plays an important role in determining behaviour and feelings of confidence about a specific problem are crucial to an individual’s capacity to solve that problem (Schulz, 2005). Self-efficacy proved to be a better predictor of behavior toward unfamiliar threats than did past performance (Bandura, 1977).

The self-efficacy belief of the teacher affects the quality of the teaching, methods and techniques used, participation of the students to learning, student’s understanding of the lesson, and thus, it defines the success of the studies. Hence, the well-trained prospective teachers are expected to have high self-efficacy beliefs before everything else (Üredi, I & Üredi, L., 2005). Preschool teachers’ self efficacy beliefs towards mathematics education is thought to be influenced the teachers’ activities during the education process. By analysing the indications held upon beliefs, Pajares (1992), stated that teachers’ beliefs are formed too prematurely; the earlier a belief settles in an individual, the harder it would get to change that belief; the later the belief settles in, the weaker it gets and that it would easily be replaced (Güven, Karataş, Öztürk, Arslan, & Gürsoy, 2013).

Platas (2008), made his studies concerning preschool teachers’ opinions and sufficiency. In his study, he indicated that the mathematics education exercises in preschool classes were influenced by the teachers’ opinions at a major level.

Once the resources are observed, researches analysing the Turkish teachers’ opinions regarding to mathematics education as a whole are limited. As a result, these researches are of great importance in terms of education.

Because of the mathematics educations’ characteristics, contents and application process being distinct from the era followed by the preschool, it is of great importance that the testing devices are being developed targeting to improve the preschool teachers’ opinions and self-sufficiency relating to this field being dominant and dependant of the preschool education. The testing devices that would be developed in this field are required to be planned in accordance with the preschool education contents.

## 2. Method

“Self-Efficacy Scale of Pre-School Teachers towards Mathematics Education” was developed to define the self-efficacies of the teachers working in pre-school institutions towards the teaching of mathematics to pre-school period children. The scale was graded in 5 Likert-type items and the gradations are “Totally Agree - Agree - Neutral - Disagree - Totally Disagree”. There are 36 items in the Self-Efficacy Scale and all of the items are positive.

In the development study of “Self-Efficacy Scale of Pre-School Teachers towards Mathematics Education”,



the Likert-type scale developing steps described by Tezbaşaran (2008) were followed. These steps are as follows:

- 1) Defining of the feature to be assessed
  - a) Defining the scope of the feature
  - b) Defining of the observable markers suitable for the content: Experimental Statements.
- 2) Organization of the experimental scale and pilot study
  - a) Preparing the scale material
  - b) Preparing the instructions and the answering layout
  - c) The layout of the items in the scale
  - d) Preliminary view
  - e) Pilot study
- 3) The analysis of the data obtained from the experimental scale
  - a) Scoring of the answers for the items
  - b) Calculation of the raw scores that the individuals get from the scale
  - c) The characteristics of the distribution of raw scores
  - d) The characteristics of the distribution of item scores
  - e) Item analysis

(Tezbaşaran, 2008)

For the first step of developing “The Self-Efficacy Scale of Pre-School Teachers towards Mathematics Education”, the relevant literature was reviewed. Afterwards, the definition of self-efficacy was done by consulting the ideas of 10 field experts and 40 experimental statements, which are all positive, towards self-efficacy, and related to mathematics education in pre-school period, were formed.

The instructions including the purpose of the scale, the number of items in the scale, the way of answering the items, the estimated time to answer the items, the identity of the scale-developer were prepared and the items were ordered in the scale. Initially, the opinions of one expert of Turkish Language and one expert of assessment and evaluation were granted; the first regulations were done based on their feedback. Later, the opinions 10 experts working in the pre-school education department at university were taken via “Expert Opinion Form”.

### 3. Results

When the findings of the scale were reviewed; initially in the evaluation of the field experts’ opinions, the content validity index (CVI) of each item was calculated. This index is used for each item in defining whether the experts find that item necessary or not. Since the number of experts is 10, it is concluded that the items whose CVI is above than 0.64 are necessary (Yurdugül, 2005). The CVI of 38 items out of 40, about which the expert opinions were granted, were above 0.64 and the CVI of the 2 items (23<sup>rd</sup> and 40<sup>th</sup> ones) were lower than 0.64. Those 2 items were omitted from the scale and the necessary corrections were done on the remaining items based on the opinions of the experts.

After the corrections based on the expert opinions were conducted, the scale was applied to 3 pre-school teachers and the items were reviewed in terms of their meanings and applicability. There were no corrections from the teachers about the items in the scale.

The 38 items in the experimental self-efficacy scale, with the instruction, were applied to 255 school teachers who did not participate in the real study. Based on the findings of the preliminary study, explanatory factor analysis was done for the scale’s validity and reliability.

### Explanatory Factor Analysis Results

In order to statistically define the construct validity of the “The Self-Efficacy Scale of Pre-School Teachers towards Mathematics Education”, explanatory factor analysis (EFA) was carried out. EFA aims to reach from lots of variables (items) to the a few definable constructs that those variables can explain together (Büyüköztürk, 2008).

Initially, to test whether the scale is appropriate for the factor analysis, KMO (Kaiser-Mayer-Olkin) and Bartlett tests were applied. The calculated KMO test was 92.7% (0.927). Kaiser states that this value becomes perfect as it gets closer to 1 (perfect in 0.90’ies, very good in 0.80’ies, medium in 0.70’ies and 0.60’ies, and bad in 0.50’ies), and it becomes unacceptable if it is under 0.50 (Tavşancıl, 2006). The calculated KMO values show that the data set is perfect for the factor analysis. The Bartlett’s test was found significant after the analysis ( $p < 0.01$ ). The high correlation found between the variables shows that the data set is appropriate for the factor

analysis (Kalaycı, 2009).

In the first analysis of 38 items in the scale done without the rotation of the factors, it is observed that there are 7 factors whose eigenvalues are above than 1. However, when **Figure 1** was examined, it is understood that two factors, whose variances explained by their eigenvalues are higher than other factors, are dominant.

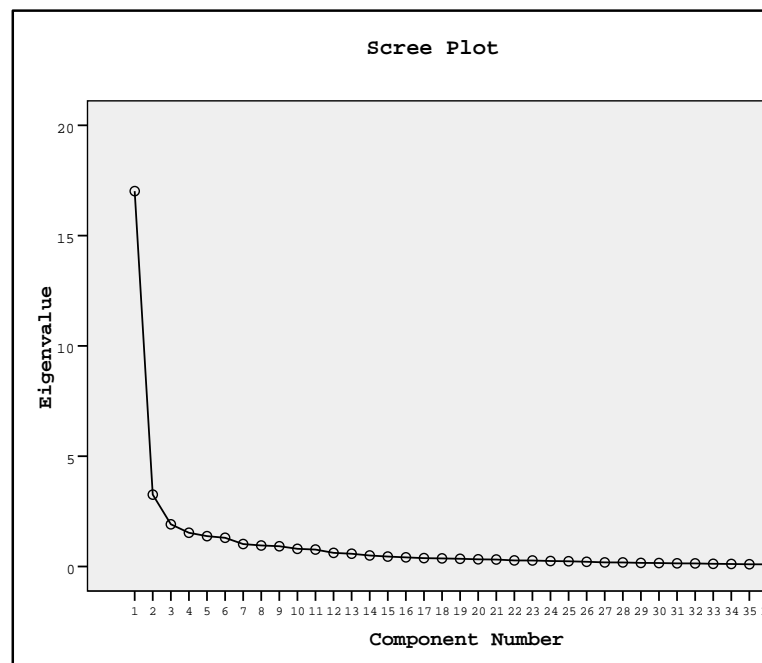
After the factor number of the scale was determined, the factor analysis was repeated and factor load values related to the two-factor structure were examined. In the explanatory factor analysis, whether an item in the scale will take place in factor to be defined or not is related to high load value of it with that factor. The items that have high load values with a factor are named as the items that assess the structure defined by the factor. As well as the desired item factor load value is generally 0.45 or above, the items whose factor load values are 0.30 can be kept in the scale (Tabachnik & Fidell, 1989). In this sense, 21<sup>st</sup> and 27<sup>th</sup> items whose factor load values are below than 0.30 were omitted from the scale. The analysis was carried on with the remaining 36 items in the experimental form and it was detected that the scale was gathered under 2 factors after the repeated Varimax rotation results. The calculated factor load values of the items based on the analysis were shown in **Table 1**.

In **Table 1**, the calculated factor load values of the items based on the explanatory factor analysis are seen. The first factor of the self-efficacy scale, which has a 2-factor structure, explains the 46.597% of the total variance, and the second factor explains the 9.035% of the total variance. The two factors explain the 55.632% of the total variance together.

Büyüköztürk (2008) states that 30% or more for the variance explained in one-factor scales could be accepted as sufficient. Besides, a value between 40% and 60% for the variance explained in multi-factor patterns could be accepted as sufficient (Çokluk et al., 2010). Therefore, it can be concluded that the variance that the scale explains, thus the construct validity could be acceptable.

In order to test the reliability of the scale, for each factor and for the overall scale, Cronbach's Alpha reliability coefficient was calculated. The reliability coefficient of the first dimension of the scale is 0.95; the reliability coefficient of the second dimension is 0.951; the reliability coefficient of the overall scale is 0.967. Kalaycı (2009) states that the scales that have a reliability coefficient of 0.80 or above are accepted as highly reliable. Based on these findings, it was found out that the developed scale and its two factors are highly reliable.

In naming of the factors of the 2-factor self-efficacy scale, by taking the opinions of the field experts, the first factor that have 20 items was named as *self-efficacy towards preparing mathematics activities in pre-school period* and the second factor including the other items was named as *self-efficacy towards applying mathematics activities in pre-school period*.



**Figure 1.** Scree plot of the eigenvalues of the items.

**Table 1.** Factor load values of the items based on the varimax rotation results.

Items	Factor 1	Factor 2
S13	<b>0.770</b>	0.116
S12	<b>0.761</b>	0.246
S9	<b>0.721</b>	0.230
S10	<b>0.713</b>	0.304
S8	<b>0.713</b>	0.292
S15	<b>0.709</b>	0.356
S6	<b>0.707</b>	0.207
S7	<b>0.706</b>	0.252
S16	<b>0.701</b>	0.299
S5	<b>0.693</b>	0.351
S3	<b>0.693</b>	0.248
S11	<b>0.677</b>	0.239
S4	<b>0.674</b>	0.302
S2	<b>0.674</b>	0.223
S14	<b>0.670</b>	0.189
S17	<b>0.577</b>	0.301
S20	<b>0.571</b>	0.180
S1	<b>0.566</b>	0.304
S18	<b>0.555</b>	0.385
S19	<b>0.504</b>	0.330
S32	0.167	<b>0.850</b>
S34	0.230	<b>0.821</b>
S31	0.197	<b>0.796</b>
S35	0.267	<b>0.787</b>
S30	0.244	<b>0.783</b>
S37	0.241	<b>0.779</b>
S33	0.246	<b>0.741</b>
S36	0.253	<b>0.698</b>
S38	0.321	<b>0.683</b>
S28	0.236	<b>0.680</b>
S29	0.308	<b>0.637</b>
S23	0.455	<b>0.630</b>
S25	0.427	<b>0.608</b>
S22	0.358	<b>0.596</b>
S24	0.487	<b>0.593</b>
S26	0.283	<b>0.505</b>

#### 4. Discussion

When the steps for preparing the scale and the analyses are examined, factor load values of the items based on the explanatory factor analysis are seen. The first factor of the self-efficacy scale, which has a 2-factor structure, explains the 46.597% of the total variance, and the second factor explains the 9.035% of the total variance. The

two factors explain the 55.632% of the total variance together. Büyüköztürk (2008) states that 30% or more for the variance explained in one-factor scales could be accepted as sufficient. Besides, a value between 40% and 60% for the variance explained in multi-factor patterns could be accepted as sufficient (Çokluk et al., 2010). Therefore, it can be concluded that the variance that the scale explains, thus the construct validity could be acceptable.

## 5. Conclusions

In order to test the reliability of the scale, for each factor and for the overall scale, Cronbach's Alpha reliability coefficient was calculated. The reliability coefficient of the first dimension of the scale is 0.95; the reliability coefficient of the second dimension is 0.951; the reliability coefficient of the overall scale is 0.967. Kalaycı (2009) states that the scales that have a reliability coefficient of 0.80 or above are accepted as highly reliable. Based on these findings, it was found out that the developed scale and its two factors are highly reliable.

Aksu (2008) made some analysis according to the differentiation of the primary school, science and preschool teacher candidates according to their beliefs of self-efficacy towards mathematics education, gender, majors and departments at high school. After the research of Aksu, it was determined that teacher candidates had high tendency in terms of the self-efficacy towards mathematics education and sub-dimensions of handling. It was found that there were no meaningful differences among teacher candidates in terms of their departments. The number of the studies which were done to measure the perception of the self-efficacy and beliefs of the preschool teachers towards mathematics education is really limited. For example, in their studies, Aslan, Bilaloğlu and Aktaş Arnas (2006) made individual interviews with 22 preschool teachers at independent kindergartens about how often they include mathematics education in their daily schedules, which sources they use for mathematics education, which methods they use and how they assess themselves in applying the methods. At the end of the studies, it was found after the observations that although most of the teachers stated that they included mathematics activities in their daily schedules, only half of them used these activities. In such situation, observation method should be used to support the scale results in the studies. Studies are generally about teacher candidates. There has been limited research about self efficacy beliefs of teachers as it relates to preschoolers' math competence. So the present study has the findings to contribute to the field.

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# The Study on Case-Driven Methodology to Teach Software Engineering in Graduate Education

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## Abstract

This paper discusses the reform of teaching contents, teaching model, teaching method of software engineering courses, and assesses the effects of a series of reform measures and programs. It formed a case-driven methodology to teach software engineering. The teaching practice undertaken by Northeast Petroleum University has shown that the methodology provides graduate students with the opportunities to experience the realistic software engineering problems and environments, and then effectively raise their interest in learning.

## Keywords

Software Engineering, Graduate Education, Case-Driven

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## 1. Introduction

Software engineering teaching plays important roles in computer education of universities. It involves basic principles, methodologies, techniques and tools used in development of complex software systems. The teaching effect has important influence on the future work of students engaged in software development. However, it is not easy for graduate students to understand the knowledge of software engineering. The reason is twofold. First, most of the methods in software engineering are proposed to solve the problem of developing software system in large scale and they seem nonsense to the little prototype system developed in experiments. Second, graduate students have few opportunities to experience realistic case of complex software development. Therefore, they have no idea of the problem in complex software development.

In order to improve the effect of software engineering teaching, the case-driven methodology to teach software engineering is proposed in this paper. Case-driven teaching is a flexible model which exploits the basic

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capacity for students to learn from cases and the basic desire of teachers to tell cases that are indicative of their experiences (Li, 2010; Guo et al., 2010). The case-driven methodology to teach software engineering makes the students participate in a case that the students found interesting and where the telling of a case would be appreciated. Through participating in some typical cases, the students are demanded to apply principles, methods and tools to solve realistic problems (Yang & Liu, 2009; Teiniker et al., 2011). The teaching practice undertaken by Northeast Petroleum University has shown that the methodology can effectively enhance their interest in learning software engineering.

This paper includes the following contents: the next section introduces the principle to select and design cases. The third section specifies the process to teach software engineering in graduate education. The fourth section analyzes the teaching effects. At last, the conclusions are drawn.

## 2. The Principles of Designing Cases

Integrating theory and practice is emphasized in case-driven teaching, where the students are made to learn knowledge on their own initiative and trained to cultivate the ability to solve realistic problems. This is consistent to the goal of software engineering teaching. In addition, the quality of the cases has important impact on the interest of students. Therefore, the following five principles should be conformed during design of teaching cases.

### **Diversity Principle**

There are widely different types of software systems, the software system development process used by the software development process and methods are different according to different types of software systems, so the software engineering teaching cases should not include only a single type system, but cover a variety of types of software. For example, during the phases of requirement analysis and system design, the cases of developing the management information system, real-time system, network software development should be included at least.

### **Interesting Principle**

Interesting is critical to make the students to learn knowledge on their own initiative, so it is very important to select some interesting cases, such as the greedy snake game development, memos tool development, online teaching management system development, etc.

### **Complexity Principle**

The teaching cases should have certain scale and complexity and need three to five students participates in the analysis and design. Otherwise, it is hard to let the student understand the effects of the principles, methods of software engineering.

### **Variability Principle**

It is better to predefine some points of variability in one teaching cases, in order to simulate the realistic development processes which make developer have to deal with continuous change of user requirements. In this way, the students may understand the importance the scalability of software architecture when dealing with changes of requirements.

### **Completeness Principle**

It is better to make the contents of the case cover the complete lifecycle of software systems, a variety of methods and technologies are integrated, to raise students' comprehensive ability to solve problems. However, because of the limit of time, it should not take a very long time to let the students to write programs, one case should cover at least requirements analysis, architectural design, detailed design, and another case is used to practice testing.

## 3. The Teaching Processes

Effective teaching is based on proper teaching processes, which can be divided into steps.

### **1) Preparation**

Before the formal discussion begins, the materials of cases are hand out to each student. It is guarantee that the students have enough time to learn the cases and retrieve necessary literatures. In this way, the students can initially form their own opinions and solutions to the problems in the cases. This stage is indispensable in the whole teaching process. If the students do not fully understand the contents of the cases, the teaching effect is going to be affected.

## 2) Construction of Organization

Construct some groups collaborate to solve the problems. The size of each group should not be too big, usually within three to five personal advisable. The students are allowed to select their partner freely.

## 3) Requirements Analysis

In the teacher's guidance, the group members are inspired to discuss freely, think actively, and make the case to discuss closely around the key requirements. In the process of the discussion the group members must be active to speak, fully showed his opinions to the problems of the cases. Other group member should pay attention to the opinions. Through comparing their team opinions, try to make comprehensive decisions. The result of this stage is requirements model and specification. Finally, the requirement specifications are checked among groups in order to simulate the process of requirements checking.

## 4) Software Design

According to the requirements specification of their own team, apply the technology of design to draw a software solution to the requirements, then Select another requirements specification from other team, proceed to design. The result of this stage is software design model. Finally the requirement specifications are checked among groups in order to simulate the process of requirements checking.

## 5) Coding

Because of the limit of course time, it is impossible to implement all of the modules designed in the last stage. Therefore, some typical modules selected to practice coding.

## 6) Testing

The purpose of this stage is to simulate the test procedure. First, arbitrarily select the codes from other team. Then design the test cases, write test script and implement them. The result of this stage is the report of software testing.

## 7) Summarization

After the completion of the case, the teacher first make the summarization according to the performance of each group, analyze some good advice and unique insights and puts forward the deficiencies and problem analysis thorough and comprehensive degree comments, so as to improve the quality of the case discussion, and write case analysis report. Through the written report, students' abilities to presentation are raised.

## 4. Teaching Effects

In order to assess the effect of the case-driven teaching, sixty students from four specialties (computer science and technology, electronic science and technology, information management, education technology) are divided into two groups. First group was taught using the methodology described in this paper, the other group was taught using traditional methodology. The contents of course are the same. The comparison of teaching effects is depicted as **Table 1**. The ratio of excellence and good of first group reaches 50%, while the ration of excellence and good of second group reaches 21%. In addition, the opinions of the first group are more comprehensive than the second group. In the experiments, the first group is more active and few solutions are similar.

## 5. Conclusion

The teaching effect of software engineering has important influence on the future work of students engaged in software developments. It takes a long way to raise the quality of software engineering teaching. The practice of case-driven methodology to teach software engineering reaches good effect. In order to satisfy the requirements of technology advance, we are going to continue to explore the new teaching methods and enrich the base of teaching cases, try to cultivate more and more creative talents.

**Table 1.** The comparison of teaching effect between two groups.

Ratios	First Group	Second Group
Excellence	15.16%	5.22%
Good	28.53%	14.11%
Medium	36.56%	53.3%
Pass	16.5%	20.55%
Fail	3.25%	6.82%

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# The Educational Implications of ADHD: Teachers and Principals Thoughts Concerning Students with ADHD

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## Abstract

As attention deficit hyperactivity disorder has been recognized for many years, it is now an established part of our educational vernacular and it continues to be addressed in classrooms, and in meetings across America. Children are continually being assessed, Section 504 plans are being written and teachers receive in—service as to how to cope with children in classrooms across America. This paper will review some of the educational implications of ADHD in the schools—many of which are well known, and some only tangentially recognized. It is hoped this this paper will sensitize teachers, principals, school psychologists and others working with ADHD.

## Keywords

Attention Deficit Disorder, Hyperactivity, Teachers and Principals Perceptions of Children with ADHD, Behavioral, Cognitive, Emotive Characteristics of Children with ADHD

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## 1. Introduction

In 1995, Thomas Armstrong wrote the widely read book, *The Myth of the A.D.D. Child*. Armstrong was a former special education teacher and psychologist who became a bestselling author and consultant. Armstrong became the guru of the moment in the A.D.D. (Attention Deficit Disorder) debate, arguing that students were being over-diagnosed medically and that A.D.D. could be “cured” by social intervention rather than medication. Since Armstrong’s work, the term A.D.D. has fallen out of medical use with the new diagnosis being A.D.H.D. (Attention Deficit Hyperactivity Disorder). A.D.D. is still a commonly used term in the public schools, however, the American Psychiatric Association in the Fifth Edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) released in May of 2013 dropped A.D.D., changing the criteria to diagnose a person with

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A.D.H.D. (Kinman, 2012). Those that do continue to distinguish between A.D.D. and A.D.H.D. recognize the hyperactivity component as separating the two.

A.D.H.D. requires a medical diagnosis and typically will involve a medication as treatment. The controversy continues as to whether A.D.H.D. is over-diagnosed and those that are diagnosed are unnecessarily medicated.

Holland and Riley (2014) report that 6.1% of American children are being treated for A.D.H.D. with some form of prescribed medication. This represents a 42% increase in diagnoses over the past eight years. Some of the more common stimulants utilized in the treatment of A.D.H.D. are Dexedrine, Ritalin, Cylert and Adderall (Papolos, K. M. D. & Papolos, J., 1999: p. 124).

The educational implications of ADHD are many, and while some have been tangentially addressed, there are both gross and fine implications and there are subtle and not so subtle implications. This paper will first review the educational implications, including diagnosis and medication and then address the educational concerns that are often not examined and explored.

In terms of general learning, the student with ADHD does not seem to be able to focus, concentrate, attend, and remain on task for long periods of time. This child is missing out on vital information that may impact later learning. The child is not learning to follow directions, to listen, and hear and contribute to class discussion and the child or adolescent is missing out on some subtle nuances of language and pronunciation and articulation. Parents and teachers have many questions and concerns about ADHD and many books have been written about this topic (Nass & Leventhal, 2005). And it seems increasingly that more and more children are being diagnosed with ADHD, but little is forthcoming about the most appropriate way to treat and educate these students with ADHD and the educational implications of ADHD.

### 1.1. Behavioral Issues

Because of the fact that the student is often disruptive, hyperactive and inattentive, teachers have to attempt major modifications and accommodations for their behavior. The message that is sent to the child is clear—"You are a behavior problem". You present a challenge to the teacher, and things have to be done to control your behavior and assist you with your problem. The child who is diagnosed now has a label, and their self-esteem has been impacted. Their self-worth may be shattered and their self-concept is now that of a child with a "problem". Sadly, many children, even with medication cannot control their behavior. In some instances, the medication has side effects, or the medication must be constantly titrated so that parents can get some sleep at night or so that the child's grades can improve. The titration or increasing or decreasing of medication can be very time consuming as teachers have to fill out rating scales, or the child has to receive some continuous performance tests to see if in fact the medication is making any kind of appreciable difference.

There are different aspects of behavior and different educational implications. There may be extreme impulsivity where the child cannot sit still or control their movements. They yell out answers rather than waiting patiently for the teacher to call on them. They may impulsively blurt out something inappropriate that they later regret. Often teachers have to spend an inordinate amount of time supervising said students. Their interventions may have to be judiciously prudent so as not to alienate the already sad, distressed child.

In terms of motor activity, the child may be continually moving, drumming with pencils and this unneeded, unnecessary behavior takes time away from on-task work. The child does not have the opportunity perhaps to read, review, repeat or complete assignments. Thus their grades are not a true accurate reflection of what they are capable of doing, but are more a reflection of the fact that their motor excesses interfere with the completion of their work. The teacher then has to constantly remind the child or the parents have to "nag" or prompt or encourage the child to complete homework, further alienating the child from school work. One specific area of concern educationally is writing—the child does not complete sentences, paragraphs and essay or book reports and thus is later ill equipped or prepared to do high school writing. And if the student is fortunate enough to be admitted to college, they are lacking skills in grammar, syntax, sentence structure and all of the basics of rhetoric and writing that are needed for college composition and grammar. ADHD does continue into adulthood for many students, although some learn how to cope with it better as they grow, mature and develop.

### 1.2. Mood

Often the child with ADHD has variable moods. The medication may interfere with their sleep—since most ADHD medications are stimulant medications and thus the child may be "cranky" irritable, or the child may

manifest the dreaded LFT-Low Frustration Tolerance. Much has been written about the fact that many ADHD kids do not have the same patience level that other students have and this contributes to them often being socially isolated, and loners. Educationally the teacher must often provide an excessive amount of reassurance, and continually compliment the child for on task work completed in a positive manner. The teacher has to perhaps explain to other students that “some pupils have difficult days” and are not always at their best. One of the educational implications of all this is that the teacher’s attention is being taken away from the education of other students. Quite often, teachers have not just one child with ADHD in their class but two or three—in addition to other children who might have a learning disability, an emotional or mental health problem or a child with intellectual deficiency.

### 1.3. Organization

The student with ADHD is often lacking in organization, planning, and structure and the teacher has to be the external supplier of organization for that student. Often a three ring binder is needed to help the student organize their work. Often a notebook is required for the student’s homework. Often a list is required so that the pupil can remember to bring certain materials to school. There is often a need for the pupil to clean out their desk or locker on an ongoing basis. If the child is not externally organized, in all probability, the student is not internally organized in terms of their own cognitive structures. Their approach to learning maybe haphazard and chaotic. Or there may not be any rhyme or reason to the way in which they approach any type of assignment. Often an extra set of textbooks is needed for that child at home. The parents may have to provide an organizational framework at home in terms of time to begin homework, take breaks and to keep their pencils, pens or even their I pad organized. Lists of materials may need to be constructed.

Some teachers procure colored three ring binders, and place the subjects (Math, English, etc.) on the outside of the three ring binder. Some teachers purchase these items out of their own pockets so as to expedite the success of the child with massive disorganization problems. Students are not “graded or evaluated” on how well they organize their work, or even simple assignments. But structure does help the student to complete tasks and lacking structure, the student will sometimes not persevere, and sometimes fail to complete tasks.

### 1.4. Compliance

One of the main functions of the school is to assure that pupils are ready and prepared to live responsible, mature, reliable, dependable lives. The teacher may have to continually remind the student about rules, procedures, fire drills, and appropriate behavior. Again, this takes time away from direct instruction—and as any teacher will tell you, instructional time is valuable and once lost it can never be regained. Rules and regulations are part of any school’s framework. The child with ADHD may understand these rules, but may have quite a difficult time complying with these rules and trivialities (in their minds). While contingency and behavioral contracts are often utilized to ensure that the student understand the rules and procedures, the student due to their ADHD cannot always follow and comply. If there should be some discipline problem, the school will have to conduct a manifestation determination to see if the infraction was caused by the student’s condition. With ADHD children, their failure to comply was not out of maliciousness or malice, but rather a failure of the frontal part of the brain to control impulsivity.

### 1.5. Language

Although it has not been extensively researched, it is hypothesized here that a great many students with ADHD lag behind their contemporaries in terms of language. It is only reasonable to conclude that when students are inattentive or hyperactive, that they are not absorbing the expressive language of teachers, who are endeavoring to ameliorate the rhetoric of their students. As such, subtle nuances, verbs, adverbs, and various gems of language are often lost. The student may have the attention and be driven to drivel on the Internet, but such endeavors do not enhance the child’s social and interpersonal language nor their receptive language skills. The child may hear quite negative comments about their inability to focus, but not learn the language of the subject in which they are embroiled. In math, they fail to hear the words “subtract” and denominator or numerator. In biology, they miss the words osmosis and mole in chemistry. Thus, they are continually grasping and searching for meaning and attempting to keep up with their contemporaries. Further, since the pupil is not paying attention



to the language of peers, they may fail to hear the rules of the game, and important elements of teamwork and cooperation.

The inattentive child may be less able to express themselves and be exasperated at their inability to describe subtle nuances, and to articulate their feelings, and emotions. This is why counseling is so important for students with ADHD—they can at least spend time with an adult who may listen to them and encourage them and attempt to elicit some mature conversation from them. The counselor can also advocate for them with teachers.

### 1.6. Academics

ADHD impacts certain subjects a good deal more than others. Mathematics is one subject that requires intense concentration and what is termed “freedom from distractibility” (in other words, small noises, movements, can impact the child and cause them to go “off task” or to lose whatever concentration they were able to maintain. Mathematics is one subject that also requires a good deal of frustration tolerance—something that most kids with ADHD do not have. Many students do not like math or arithmetic to begin with, and thus a student with ADHD is going to have an even more difficult time sustaining attention over a long period of time. In terms of educational implications, a student formally diagnosed with ADHD should be receiving appropriate accommodations. I emphasize “appropriate” accommodations and modifications here, because not all students receive the most suitable accommodations for various subjects at various grade levels. Indeed, many schools often minimize the needed accommodations indicating that they want the child to function independently or autonomously. Many schools often decry major modifications as they could be quite time consuming and labor intensive for teachers to implement. And the schools are more often concerned with remediation rather than modifications.

Most often, the student will receive preferential seating, or perhaps extended time to complete assignments or other tasks. In other cases, the work load for the child with ADHD will be reduced. Thus, a student with severe ADHD might only need to complete the odd questions instead of both the even and the odd in some assignment. Or they may only need to complete 25 out of 50 multiplication problems. In certain math circles, with story problems, the child may need to have the story problem read to them, so that they would be able to internalize and understand what the story is asking.

One other area of academics that needs to be explored is reading. It should come as no surprise to anyone that reading is an academic area that requires sustained concentration and attention. The child must decode the words, pronounce them internally in a fluid manner, then attempt to link words together to form sentences and then link the sentences together to procure the “gist” of meaning from the paragraph and then attempt to remember the main ideas, and the who, what, when, where and why of the story.

For some students with ADHD, this is an insurmountable obstacle, and the student may fare better if the book was on tape, or even if the child were allowed to read the material aloud. Since reading permeates educational endeavors, if a child has ADHD, then the child is at a severe disadvantage—with or without medication, and with or without accommodations. And one thing that should be pointed out is that across all of the previously mentioned domains, while the child may be on medication, the medication may not last the entire day. Thus, teachers report that the child “begins losing it” around 2:00 p.m. and the teacher is keenly aware and sensitive to these issues. The teacher however, does not have the power or authority to request that the physician increase the medication, and in fact, some physicians are hesitant to increase medication, and will indicate that they practice quite conservatively in this realm.

“Hands on” classes seem to bode well for students with ADHD. However, in certain classes such as shop, extra care and supervision needs to be taken to ensure that the child with ADHD handles machinery and tools properly, and the same is probably true in chemistry and science related subjects.

### 1.7. Remediation

Due to their ADHD, many students have simply missed out on a good deal of information. They were not paying attention when the teacher taught about Columbus or George Washington, and thus a later teacher is perplexed when the ADHD student does not recognize these names. Or perhaps the student was not paying attention during long division or “invert and multiply” when doing fractions. Thus, a teacher has to do remediation or even attempt a Response to Intervention approach to assist the child with the missing gaps in their educational experience. This again, takes time from other students who may also be inappropriately mainstreamed into regular education or may have transferred from another school.

This first section has examined just a few of the educational implications of ADHD from the teacher's point of view. The parents certainly have their own point of view in terms of attempting to get the child to complete their homework, study, and review for tests and complete book reports and science projects. Parents see the educational implications in terms of the child's report card and their insight that they may be aware that the child is capable of better work. In fact, the school psychologist may have tested the child and found out the child's I.Q. score from a Wechsler or Stanford Binet-5 test. The school psychologist may also question the accuracy and validity of these I.Q. test scores if the child is not on medication. One wonders how much better the student could have done if they were on medication.

Quite often the educational implications of ADHD is that society loses a child with a good deal of potential as the educational needs of that student are not being met.

### 1.8. The Educational Implications of ADHD—The Principal's Perspective

This section of the paper will discuss the feelings of several principals toward A.D.H.D. students, as reported to teachers in their buildings. All of the teachers are cohorts in an educational administration program and this inquiry was done as part of an assignment assessing attitudes about A.D.H.D. The practitioner in the cohort was asked to inquire of their principals and others directly involved with special education what position is taken with the A.D.H.D. child.

## 2. Principals Thoughts Concerning Students with ADHD

A.D.H.D. symptoms typically contain three sets of indicators; inattention, as the person is easily distracted; hyperactivity, the child may fidget a lot; and impulsivity, the child may blurt out answers or other remarks too quickly. These types of children can create difficulty in the classroom for teachers and often make visits to the principal's office. Speaking as a school administrator for over thirty years, the second author understands that principals and superintendents do not enjoy problems of this nature that often times are difficult to solve. Is Phillip just out of control because of poor parenting when he fidgets and cannot stay in his seat or is Phillip in need of intervention? Principals and teachers are not medically trained and this is why only a doctor can determine whether or not a child has a medical condition such as A.D.H.D. Public school principals and teachers have to be tolerant of behavioral differences, along with meeting the growing demand of testing. Many teachers still view the inclusion of students with disabilities into mainstream settings as difficult and stressful.

To quote Swaab (2014: p. 327) "we all start life with a host of possibilities and talents but also many limitations, like a cognitive tendency to addiction, and a set level of aggression, a predetermined gender identity and sexual orientation and a predisposition for ADHD." If Swabb and others are correct, our hypothetical "Phillip" cannot be faulted for the challenging behaviors that he manifests.

I (C.W.) have viewed countless children in both the classroom and the playground and often I have witnessed children that talk excessively, always seem to be on the go, squirm in their seats and/or tap their hands or feet, and have trouble waiting their turn, not to mention raising their hands and leaving their seats in an excited manner when they have an answer to give. Lots of children appear to me to have been symptomatic of A.D.H.D., although only a select few were on any type of medication.

While students "back in the day" were left to fidget or sent out into the hallway or to the principal's office, schools today are doing more to accommodate students with A.D.H.D. While medication is still the most common solution, some schools are utilizing exercise balls instead of desks, exercise breaks, and Hokki stools. Exercise is known to increase levels of neurotransmitters. Any type of physical exercise can have a positive effect on a student with A.D.H.D., not only helping to contain classroom behavior, but positively affecting the well-being and attitude (Rowh, 2014).

As a superintendent of schools I was in the habit of running five miles over my lunch hour. When I was superintendent in the Beardstown, Illinois, School District in 1994 there was a male special education student of about the age ten who created nothing but havoc for the teacher. It became my habit to have this child run laps with me on the track, just to get him moving. We would run for about thirty-minutes and then the student would go back to class and I would continue on. This was the pattern for several months and it did in fact, settle the child down during the afternoon until school was dismissed. I never at the time considered this to be an intervention strategy for A.D.H.D., but it appears to have been.

In a study conducted in Australia, Avramidis and others have detailed some contextual variables to teachers' attitudes toward inclusive education and we would speculate that these variables are applicable to principals as well (pages 191-121). Among some of the findings reported by Subban and Sharma of the variables are "more experienced teachers appear to foster less positive attitudes than younger teachers; and lack of training in the field of inclusion may lead to less positive attitudes toward the inclusion of students with disabilities into the mainstream settings (page 43)." I (C.W.) believe that it would make for a most interesting study to determine the age and inclusion experience of the principals quoted in this study.

I have reported exactly what the teachers indicated that their administrators stated. Not all of the responses are reported as there are over forty of them. I have attempted to offer a sample of some of the more interesting and representative comments.

A student reports the principal said:

*According to the SPED department, ADHD is a very challenging condition for student, parents, and teachers. There are many views on ADHD at my school and the way in which it should be treated. Often in a staffing the parents are presented with the choice to medicate their children or not. This decision can directly influence the effectiveness of the education of these children.*

*Our school handles ADHD on an individual basis. Not all students with ADHD are under an IEP (Individual Educational Plan) nor should they be. The goal should be for the child to learn strategies for self-regulation and self-control.*

*I visited with our assistant principal, who feels that ADHD is not really a special education classification and may in fact, not even be a real diagnosis. He suggested that parents take their child to a psychologist for testing rather than take the word of a medical doctor. He did not feel that as many students are considered ADD or ADHD as in the past, but that Autism is more prevalent. He considered it just to be "the new buzz word".*

A student reports the principal said:

*When it comes to students with ADHD, my principal said that they have a place of importance, but they are far from the top of the list. There is so much more going on that the only time students with ADHD create an issue is when they have not taken their medication and are acting out. We as educators are focused on making sure that the entire classroom and the expectations of the entire classroom are met, and we cannot focus on every different need of students. I have to make sure that there are translators for the ELL students and that the SPED students have their "accommodations" that the IEP requires that there is little time for the ADHD student unless they are really acting out. Some resource classes have different activities for the ADHD students to help them manage the ADHD, but that only occurs with the students that really need that extra help on it.*

A student reports the principal said:

*Our principal said that we want to accommodate students with ADHD, but this isn't the main priority of the special education department because so many students are diagnosed with ADHD all the time. It is the responsibility of the parents and student to make sure if they are on medications that they take it. It is hard to know especially at the younger ages, if it is ADHD making a student act out or it is simply that they are a ten-year-old boy with lots of energy.*

A student reports the principal said:

*My principal said that students who qualify for Special Education under OHI as a result of ADHD are really quite a few in our school. I do not see as many students with this diagnosis as in previous years when it seemed to be more prevalent. I feel that the diagnosis of ADHD is somewhat of a catchall for describing a child who exhibits a number of inappropriate behaviors. We provide practical suggestions to teachers so that these students can access the curriculum in the same ways as most of their peers, which is what is most important.*

A student reports the principal said:

*In my small community I feel like the "real attitude" toward ADHD is that it is something that students just need to figure out, and that in a way it is made up. Students just need to learn how to cope, but a few of our teachers do make accommodations. In our school no one has an "actual" diagnosis on record. This is not necessarily because students do not struggle with inattentiveness, impulsivity or hyperactivity, because they do, but rather I feel it is a reflection on the stigma associated and the belief on the part of the parents.*

*On Thursday I sat with a parent at a parent teacher conference who told me she has thought that her son has ADHD since he was quite young (he is now in the 10<sup>th</sup> grade), but she didn't want anyone to know and she was trying to get him through school without medicating. I feel that there is a lot of misinformation concerning medication and certainly like anything it can be and is abused.*

*My son-in-law was diagnosed with ADHD in the 7<sup>th</sup> grade, but did not like or take medication. He made it through high school, college and graduate school. It was at that point he decided to look into medication. In grad school he studied more about it and decided that there was a lot of misinformation about ADHD and he began taking medication. Ten years later he still takes medication. When we were introduced I'll admit that I had kind of a negative attitude about medication, but now I am a firm believer that this is the best path for him.*

*Sometimes public opinion, not our experience or research, drives our thinking. When I was growing up I do not remember anyone diagnosed with anything, including ADHD, however it is a changing world and it seems that now everyone is on some sort of medication.*

A student reported the principal said:

*Depending on who you talk to about ADHD, the attitudes vary. Some believe it to be a true health impairment while some view it as "always denied hard discipline."*

*When a parent or teacher brings up a concern about a child being hyper-active the actual screening must be done by a certified medical doctor, a certified psychologist, or a certified diagnostician. Until recently I thought that only a certified MD could diagnose; however, I recently learned that a certified clinician can also diagnose.*

*If the child is ADHD he/she can be placed into special education receiving either a 504 plan or IDEA. A behavior intervention plan can be created.*

AUTHORS' NOTE: There were a few principals reported to question the validity of ADHD. It would be interesting to determine the age of those that doubt the diagnosis from those most recently new to the principalship.

A student reported the principal said:

*At my school students must be diagnosed with ADHD by a school psychologist or medical doctor. ADHD is a medical condition and if it is truly manifested in a student then medication is beneficial along with diet and proper accommodation. Students with ADHD should be encouraged to learn behavioral strategies.*

A student reported the principal said:

*As a principal in a preschool/kindergarten building I have found that there are differences in attitudes between preschool teachers and kindergarten teachers when it comes to ADHD.*

*Teachers of preschool students state that the younger the child, the shorter the attention span. Preschool activities are designed to allow students to be more active, to have greater freedom of choice, and to have shorter periods of seat time. Preschool children are challenging but ADHD is not the real issue. A child could have sensory issues or delays which mimic some ADHD characteristics.*

*The kindergarten teachers seem to dread the term ADHD. Although the students are older, many kindergarten teachers say that the students are "exhausting", demanding too much attention making them difficult to educate. Kindergarten teachers are more "pro" medication, which of course takes an official diagnosis.*

AUTHORS' NOTE: I (C.W.) was surprised by the response of this principal. I would have expected that kindergarten teachers would have more tolerance for squirmy children as they are not that far removed from preschool.

A student reports the principal said:

*Students with ADHD are generally treated no differently than other students. The only exception is when a student may get into trouble for some behavior connected with his/her ADHD and then I might reconsider the consequences to accommodate the student's unique circumstances.*

A student reports the principal said:

*I am supportive to my special education staff who are the true heroes. The special education teachers are the ones that mainly deal with the ADHD students through the IEPs, adjusting modifications and working with the regular education teachers. I am part of the IEP process in the beginning.*

*We have many students with ADHD and it is disheartening when they are too highly medicated and turn into a zombie. Some parents are in denial about their kid being ADHD.*

AUTHORS' NOTE: Many principals and members of the class expressed the concern that students were being over medicated.

A student reports the principal said:

*As a person that has to deal with ADHD children at school and who has a child with ADHD this matter hits home. I attended a parochial school as a student and was constantly disciplined for fidgeting, moving without permission, etc. I was never medicated or diagnosed, but looking back and realizing the issues then and the fact that I still have them, I know that I have ADHD and have empathy for children and adults that do. My son who I*

*referred to was almost placed in special education in kindergarten because of his ADHD, but with medication he turned out to be a 4.0 student. He is currently in college studying to be a teacher himself.*

*Our school has a large amount of students with ADHD and accommodate as per the 504 plan on file. It is our job to reach all students no matter what the circumstances.*

AUTHORS' NOTE: Several principals and teachers taking this class reported that ADHD had impacted their family members, or they themselves suffered from ADHD whether or not it had been diagnosed.

A student reports the principal said:

*Well, what makes them any different than any other student at the school?*

A student reports the principal said:

*We have a good deal of students identified with ADHD and we have some that struggle with similar issues, but are not yet identified.*

A student reports the principal:

*My principal did not have anything to say about the subject. The student speculates that this may be because the school does not have any special education teachers other than a reading therapist that works with children with dyslexia. My experience is that there is zero done for students with ADD/ADHD in my school.*

AUTHORS' NOTE: It seems difficult to believe that a public school would have no special education teachers. Often the accuracy of statements made by teachers is often questionable.

A student reports the principal said:

*Student accommodations for ADHD are often recommended at our school, but these accommodations are often not practiced by the teachers themselves. While it may be a poor excuse, most teachers get so busy in planning and assessing that the finer details like accommodations for special education kids are not followed to the extent they could and should be.*

AUTHORS' NOTE: As an instructor of prospective principals I find it disconcerting to understand the leadership style of this principal.

Another student reports the principal said:

*At my school, the teachers do not deal with students with ADHD as we do not know who they are and we are not expected to treat them any differently. It is expected that whatever issues students have ADHD, ADD, Autism, etc., they are expected to have it under control. All of the students' actions have consequences and they are not treated any differently.*

AUTHORS' NOTE: The principal of this student is in charge of a private parochial school.

A student reports the principal said:

*Our special education director has had recent classroom experience and feels that ADHD is over-diagnosed. She sees quite a number of students who are having attention difficulties in the classroom that do not have qualified learning disabilities and are receiving services and accommodations that should not be. Our goal as educators is to prepare students to actively participate in the post-school environment, so parents and teachers need to work on strategies for perseverance without a list of modifications and accommodations. I agree with her analysis.*

### 3. Conclusions

The results of this study are limited to students in a principal preparatory class that are also actively teaching in a school. The assignment was for them to ask their principal what the principals' ideas/impressions/thoughts were about ADHD students. There were over thirty-five responders to the assignment and in this study I (C.W.) have reported seventeen that are representative of the principals' responses.

While the answers are interesting it is hard to draw any conclusions about the responses. I am pleased that most of the administrators said that they supported the reality of an ADHD diagnosis and that accommodations need to be in place for these students; not all felt this way.

The idea that we are over-diagnosing and over-medicating students with a diagnosis of ADHD was a recurrent theme.

Many principals and students in the class said that immediate family members or they themselves had issues with ADHD. In fact, out of responders (both principals and members of the class) fifty-two percent made this statement.

It is quite apparent from the comments that different communities treat special education in general and



children with ADHD differently. It is also quite apparent that there are educational implications of ADHD, but attempting to validly accurately, reliably measure them is problematic and requires future research.

In no instance, was Section 504 mentioned. This is simply an observation, although many teachers, counselors and principals indicate that they are not aware that ADD and ADHD are covered under Section 504 and that principals, teachers and others are supposed to make appropriate accommodations and if needed, modifications.

## Summary

This paper has attempted to review the condition known as ADD or ADHD and some sample representative comments from principals have been elicited. These comments reflect a cross section of beliefs, values, attitudes and philosophies regarding ADD and ADHD. There are some critical issues regarding the educational implications of ADHD which need further exploration.

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# Exploring the Pedagogical Meaning and Implications of the 4Cs “Super Skills” for the 21<sup>st</sup> Century through Bruner’s 5E Lenses of Knowledge Construction to Improve Pedagogies of the New Learning Paradigm

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## Abstract

As economies increasingly globalize and digital technologies assume ubiquitous presence and functional utility in peoples’ lives outside educational contexts, there is an increasing realization among pedagogues that education designed to equip graduates of the Digital Economy requires the teaching of new skills rather than the traditional core subjects. This realization has led to the emergence of what is called the New Learning Paradigm which postulates that students now need to be taught the skills most in demand in the 21<sup>st</sup> century. Those skills are epitomized in what The Partnership for 21<sup>st</sup> Century Skills calls the Framework for 21<sup>st</sup> Century Skills. Keys among those skills are what The Partnership characterizes as the 4Cs super skills.. What are those skills? Why are they essential for successful learning, teaching, assessment, working and living in today’s Digital Economy? How do they align with the full set of 21<sup>st</sup> century skills? What are the pedagogical implications of these 4Cs super skills? This paper answers these questions in four steps. Firstly, it articulates the 4Cs super skills. Secondly, it explains the “Rainbow” framework of the full set of essential 21<sup>st</sup> century skills as conceptualized by The Partnership for 21<sup>st</sup> Century Skills. Thirdly, it outlines Bruner’s 5E Instructional Model and explains how it provides an excellent lens through which to approach learning, teaching, assessment and curriculum development for the 4Cs super skills in Kivunja’s New Learning Paradigm.

## Keywords

New Learning Paradigm, Partnership for 21<sup>st</sup> Century Skills, 4Cs Super Skills, Bruner’s 5E

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## Instructional Model, Rainbow of 21<sup>st</sup> Century Skills

### 1. Which Are the 4Cs Super Skills and Why Are They Essential for Success in the Digital Economy?

In declaring its commitment to American students' success in *Preparing America's Students for College and Career*, the Consortium for Smarter Balanced Assessment (SBAC, 2015) in Washington DC reiterates very well the assertion of the Partnership for 21<sup>st</sup> Century Skills (P21, 2015a) as to what the 4Cs super skills are:

Today's students are moving beyond the basics and are embracing the 4 Cs—"super skills" for the 21<sup>st</sup> Century: Creativity, Communication, Critical Thinking, Collaboration. [These] 21<sup>st</sup> Century Skills [need to be] infused in the Common Core Standards which are the end goals of the Career and College Ready Standards. (SBAC, 2015: p. 5)

Saxena (2015) agrees when she says, "These...4Cs that are the super skills for the 21<sup>st</sup> century...help develop the qualities that students need to possess in the 21<sup>st</sup> century for success in college, careers and citizenship" (p. 1). These 4Cs super skills were identified by the Partnership for 21<sup>st</sup> Century Skills (P21, 2015b) as the skills that American students need to graduate with, in addition to the traditional skills, to effectively contribute to the progress and prosperity of America. The Partnership articulated this very well in their mission statement when they said:

Every child in the U.S. needs 21<sup>st</sup> century knowledge and skills to succeed as effective citizens, workers and leaders. This can be accomplished by fusing the 3Rs and 4Cs.... To successfully face rigorous higher education coursework, career challenges and a globally competitive workforce, U.S. schools must align classroom environments with real world environments by fusing the 3Rs and 4Cs. The 3Rs include: English, reading or language arts; mathematics; science; foreign languages; civics; government; economics; arts; history; and geography. The 4Cs include: critical thinking and problem solving; communication; collaboration; and creativity and innovation. As the 3Rs serve as an umbrella for other subjects and core content, the 4Cs are a shorthand for all the skills needed for success in college, career, and life. (P21, 2015a: pp. 1-2)

Following this strong assertion, the Partnership (P21, 2015c) elevated the status of these skills to "the 4Cs—"super skills" for the 21<sup>st</sup> century" (p. 1). These are very strong assertions and they need to be taken seriously because of their source—The Partnership for 21<sup>st</sup> Century Skills. The Partnership for 21<sup>st</sup> Century Skills is an organization that was formed in 2002 in the USA out of concern that American education was failing graduates because they were graduating without the skills needed to be productive citizens in the Digital Economy. In particular, there was the realization that whereas American society outside education had embraced technology, educational institutions were lagging behind. For example in a comprehensive study that involved some 7685 young people ranging in age from 13 to 20 years and from twelve countries, Tapscott (2009) concluded that "students won't be prepared for the world of today unless schools use technology to implement real change to their model of education" (p. 144). Other leaders in the field also argued that the reliance on the orthodox 3Rs of the Industrial Age without infusing technology was failing American children and was one of the major reasons why American teens were leaving college in record numbers. For example, Prensky (2001) argued that schooling organized on the traditional model was the reason for "a massive dropout problem in many high schools in the USA" (p. 122). This line of argument was sustained by other leaders in the field such as Kelly, McCain and Jukes (2009) who proposed that:

What's wrong is that the world has changed and schools have not. Capitalizing on the astounding power of new electronic tools, the world outside education has moved beyond the idea of mass production that was the hallmark of Taylor's assembly-line approach to life. The sudden shift to the online digital world has rendered that experience irrelevant to modern students. (p. 18)

Equally unequivocal was McNierney (2004) who proposed that it was necessary for teacher educators to "model instructional methods which help future teachers understand that technology-based instruction is no

longer an option. It is a requirement” (p. 65). Other giants in the field added to an understanding of this need to infuse technology into pedagogy with assertions such as:

America’s high schools are obsolete.... By obsolete I mean that our high schools, even when they’re working exactly as designed, cannot teach our kids what they need to know today. Training the workforce of tomorrow with the high school of today is like trying to teach kids about today’s computers on a 50-year-old mainframe. It’s the wrong tool for the times. (Gates, 2005)

These arguments, powerful as they were, were really not new since we know that in the mid 19<sup>th</sup> century John Dewey (1859-1952) said “If we teach today’s students as we taught yesterday’s, we rob them of tomorrow” (Randall, 1953: p. 9). But these were nevertheless valid and forceful propositions and so, a number of high powered individuals representing powerful public and private organizations such as Apple Computer Inc., Microsoft Corporation, USA Department of Education, Dell Computer Corporation, America Online Line Time Warner Inc., Consortium for School Networking, State Educational Technology Directors Association, the International Society for Technology in Education, and the National Education Association, (P21, 2014) joined hands in an effort to identify how the gap between the knowledge and skills taught at school and the knowledge and skills in demand in typical 21<sup>st</sup> century society could be bridged. That joint effort gave birth to The Partnership for 21<sup>st</sup> Century Skills. It was set up with the onerous mission to: “Serve as a catalyst to position 21<sup>st</sup> century readiness at the center of US K12 education by building collaborative partnerships among education, business, community and government leaders” (P21, 2008: p. 4). The Chair of The Partnership articulated its mission quite well when he said that their primary aim was to answer “a question of paramount importance to America’s educators, employers, parents and the public, how can we best prepare students to succeed in the 21<sup>st</sup> century?” (P21, 2015a: p. 2). The search for answers to this question led The Partnership to develop the set of skills that today’s graduates need to master so as to be able to engage with the demands of the Digital Economy. Kivunja (2014a) calls the move to these skills the shift to “the new learning paradigm” (p. 85) which he defines as:

The new philosophical approach to pedagogy which posits that for education to truly meet “the moral purpose of education and help produce citizens who can live and work productively in increasingly dynamically complex societies” (Fullan, 2000: p. 4), learning, teaching, assessment and curricula need to equip graduates with the skills that will enable them to contribute effectively to productive capacities of the 21<sup>st</sup> century economy. (Kivunja, 2015a: p. 5)

He argues that the new learning paradigm is “the vision for students’ success in the new global economy” (Kivunja, 2014b: p. 40).

Several bloggers have also endorsed the importance of the 4Cs. For example, Gerald (2015) refers to “the concept of 4Cs as the core of teaching and learning process in 21<sup>st</sup> century education...which take center stage in schools and transform learning opportunities for all kids and is important for enrollment into a good university, career and success in today’s world” (p. 1 & 8). Lin (2014) sets out “to embrace and emphasize the importance of 4Cs...in 21<sup>st</sup> century education” (p. 2). In her blog, Caroline Lippl (2013) introduces the discussion of the 4Cs of 21<sup>st</sup> century skills quite well when she says:

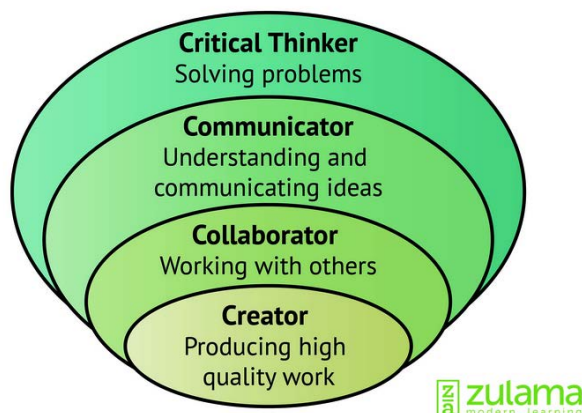
Education used to be about the three Rs, but Reading, wRiting, and aRithmetic aren’t the only skills today’s students need to be successful.... Students now need to be able to show that they can be Collaborators, Communicators, Creators, and Critical Thinkers. These skills make up the four Cs of 21<sup>st</sup> Century learning. (p. 1)

She then synthesizes the 4Cs as illustrated in **Figure 1**. Although the figure depicts each of the 4Cs as a distinct layer of knowledge construction for descriptive purposes, The Partnership for 21<sup>st</sup> Century Skills (P21, 2015a) views all the 4Cs as interdependent and interrelated in presenting them as “the 4Cs—‘super skills’ for the 21<sup>st</sup> century” (p. 1) and the “shorthand for all the skills needed for success in college, career and life” (P21, 2015a: p. 2). The discussion in the following subsections is presented along Lippl’s (2013) design represented in **Figure 1**, taking each of the 4Cs in turn.

### 1.1. Critical Thinking and Problem Solving

There is widespread consensus around the importance of critical thinking as an educational objective (See for example, Deakin, 2014; Facione, 2011; Kompf & Bond, 2001; Kuhn, 2005; MCEETYA, 2008; Miller, 1990;

## The Four Cs of 21st Century Skills



Source: Lippl, C. (2013: p. 2).

**Figure 1.** The 4Cs super skills.

Van-Gelder, 2001). For example when the Council of all Australian Education Ministers met in Melbourne in December 2008, their meeting produced what is referred to as the Melbourne Declaration on Educational Goals for Young Australians (MCEETYA, 2008), in which the ministers expressed consensus on the common goal for the Australian curriculum to create opportunities for the development of critical thinking skills among students. However, in spite of such a high confluence of supporting views, there is little agreement over the meaning of critical thinking. In recognition of this conundrum Kivunja (2015d) asserts:

Critical thinking has been defined in many different ways, some as simple as “thinking which has a purpose” and “examining the thinking of others to improve our own” (University of Sydney, 2014: p. 1); equally simple as, “a commitment to using reason in the formulation of our beliefs” (Munich, 2010: p. 471). (p. 431)

Generally, critical thinking refers to an individual’s ability to use a number of his or her general cognitive processing skills which fall into Bloom’s (1956) high-order thinking levels of analyzing, evaluating and constructing new ideas or creating. This rather general definition aligns well with that of the Californian National Council for Excellence in Critical Thinking which defines critical thinking as “the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action” (NCECT, 2014: n.p.).

Critical thinking is a super skill in the 21<sup>st</sup> century “because it enables students to think deeply and to solve non-familiar problems in different ways” (Kivunja, 2015d: p. 433). This is very important because we know that the 21<sup>st</sup> century economy driven by digital technologies is typified by ever changing information which requires participants to have the capacity to manage and respond well to unfamiliar problems. It helps students to be open-minded, to question, not to take anything for granted and to think and reason through issues in a rational manner (Kompf & Bond, 2001). It is a super skill because, as highlighted by Kivunja (2014b), it equips graduates with “the skills that will enable them to be productive members in the Knowledge Economy, function effectively and responsibly and solve problems in ways that are sensitive and caring for others, society, the environment and the world as a whole” (p. 41). Facione (2011) puts it well when he asserts that critical thinking is essential for harmonious human society. Trilling and Fadel (2009) agree when they propose that training in critical thinking enables graduates to reason effectively, to engage in system thinking, develops their ability to make rational judgments and decisions, and enhances their ability to solve problems. These leaders in the field emphasize: “Critical thinking and problem solving are considered by many to be the new basics of 21<sup>st</sup> century learning” (Trilling & Fadel, 2009: p. 50). The Partnership (P21, 2011) says that critical thinking and problem solving are keys among the sets of skills that “separate students who are prepared for increasingly complex life and work environments in today’s world and those who are not” (p. 2). The Partnership further highlight the importance of critical thinking when they assert that critical thinking involves “looking at problems in a new way, linking learning across subjects & disciplines” (P21, 2015b: p. 1).

## 1.2. Communication

As illustrated in Lippel's (2013) **Figure 1** presented earlier, communication is about understanding and sharing ideas. Piascik (2015) agrees and adds it involves "sharing thoughts, questions, ideas and solutions" (p. 1). Effective communication has always been an essential skill for success in business, family relationships and all walks of life. However, the instantaneous mix of people of different cultures that has been enabled by 21<sup>st</sup> century information, media and digital technologies has made the need for effective communication more apparent and more vital than in previous generations. Whereas in the Industrial Age emphasis was on correct speech, fluency in reading, and accuracy in writing, the advent of information and digital technologies of the 21<sup>st</sup> century has brought with it new dimensions which call for a deeper and broader set of communication skills for graduates to be able to be effective participants in the Communication and Information Age, where there is much greater diversity of cultures. As The Partnership for 21<sup>st</sup> Century (P21, 2014) puts it, "Communication skills have always been valued in the workplace and in public life. But in the 21<sup>st</sup> century, these skills have been transformed and are even more important today" (p. 13).

Pedagogy abounds with research-based evidence indicating that interactional and transactional communication skills are essential for students' success, not only in the classroom but also in life outside school after graduation. (Coulson, 2006; Cruickshank & Kennedy, 1986; Muijs & Reynolds, 2011; Wragg, 1984). In *The World Beyond the Classroom*, Gerald (2015) asserts that communication is a super skill in the world because it is through communication that:

Thoughts, questions, ideas and solutions are shared. In today's competitive world, communication skills in careers especially in business oriented careers are the most sought after quality of an educated person. Thus, being able to communicate effectively is the most important of all life skills. (pp. 10-11)

Trilling and Fadel (2009) explain well what effective communication in the 21<sup>st</sup> century requires of graduates and why it is an essential skill. They say that graduates should be able to:

Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills, listen effectively to decipher meaning, including knowledge, values, attitudes and intentions, use communication to inform, instruct, motivate and persuade, utilize multiple media and technologies, communicate effectively in diverse environments. (Trilling & Fadel, 2009: p. 55)

A close look at these requirements quickly highlights why communication skills are among the 4Cs super skills because it is hard to imagine how anyone could effectively participate in the workplace or in any meaningful relationship without practising these skills in some form of verbal communication, non-verbal communication, written communication, audio communication, visual communication, or digital communication. As shown in the above quote, effective communication is about getting your desired message across effectively to your target audience; and this requires training so that graduates gain the communication skills they need to utilize in the workplace after school. It is therefore essential that graduates be taught how to plan their communication and to make sure that they communicate clearly, concisely, concretely, coherently, correctly, completely, and courteously (Baird & Stull, 1992: p. 16).

## 1.3. Collaboration

In the *Good Practice Guide* for the Bachelor of Laws at Flinders University (in Australia) "commissioned by the Law Associate Deans Network to support the implementation of the Threshold Learning Outcome 5: Communication and collaboration" (Handsley, 2011: p. 1) the *Guide*, following Kift, Israel and Field (2010), defines collaboration skills as "the skills of teamwork, working in groups, and working cooperatively with others" (Handsley, 2011: p. 1). Thus collaboration is important whenever teamwork, group work and cooperation are involved. It is noteworthy, as well articulated by Eggen and Kauchak (2012), that in pedagogical practice these three elements of collaboration are not identical. However, as explained by Brady (2006) they all involve the sharing of "social and cultural experiences" (p. 9) among participants. When applied effectively, collaboration can have significant positive effects on the people involved as was experienced, for instance, at William Clarke College in New South Wales (Australia), where teachers who taught collaboratively as a pair in one class in which they organized the students to work collaboratively achieved some very impressive results for both teachers and their students (Raphael, 2015). Impressive results about the power of collaboration to improve pedagogy



ical practices, student management and professional collaboration were also found by Mary Brownell, Allyson Adams, Paul Sindelar and Nancy Waldron at the University of Florida and Stephanie Vanhove (2006) at the University of Virginia in their joint study on learning from collaboration. Many other leaders in this field, including Kagan (1994), Johnson and Johnson (2009), Killen (2013) strongly endorse the power of collaboration to improve efficiency not only in teaching and learning but also in all walks of life after school. Thus, given the extent to which digital technologies have accentuated the confluence of social and cultural experiences among people, not only in one workplace but nationally and internationally, it is easy to appreciate why The Partnership for 21<sup>st</sup> Century Skills (P21, 2015a) included collaboration as one of the essential 4Cs super skills for successful learning and increased productivity in real work environments in the 21<sup>st</sup> century.

### 1.4. Creating and Innovating

The terms creativity and innovation are often used to refer to the conscious exploitation of “new ideas, or new uses of ideas, to add social or economic value” (IBSA, 2009: p.1). The Partnership for 21<sup>st</sup> Century (P21, 2007) says that “in today’s world of global competition and task automation, innovative capacity and a creative spirit are fast becoming requirements for personal and professional success” (p. 15). The Partnership (P21, 2014) emphasizes that in today’s economy fuelled by information and driven by digital technologies “creativity and innovation are key drivers in the Global Economy” (p. 24). As a matter of fact, the importance of creativity and innovation to be a foundation for the essence of survival of humans was well articulated by other leaders in the field such as De Bono (1995) who said “There is no doubt that creativity is the most important human resource of all. Without creativity, there would be no progress, and we would be forever repeating the same patterns” (p. 13). It is this emphasis on the vital role of creativity and innovation in the success of human endeavors that inspired The Partnership (P21) to characterize creativity and innovation as one of the 4Cs super skills essential for success in modern living. And it is important that this super skill be taught well because it is very complex involving, according to Karlyn Adams (2006) the confluence of three components:

- **Knowledge:** All the relevant understanding an individual brings to bear on a creative effort.
- **Creative Thinking:** Relates to how people approach problems and depends on personality and thinking/working style.
- **Motivation:** Motivation is generally accepted as key to creative production, and the most important motivators are intrinsic passion and interest in the work itself. (Adams, 2006: p. 4)

The complexity of this super C skill is highlighted further by Teresa Amabile who explains that creativity involves some five complicated processes, namely, being able to disagree with others and yet feel comfortable about it, trying out solutions that are different from current ones, integrating knowledge gained from different fields, managing and solving difficult problems, and the ability to recognize a problematic situation, step away for a while looking for a solution, and return later with a potential solution (Amabile, 1998).

## 2. How Do the 4Cs Align with the Full Set of 21<sup>st</sup> Century Skills of the New Learning Paradigm?

The 4Cs super skills are not the only skills needed for successful study, work and living in the 21<sup>st</sup> century. As well explained by Kivunja (2014a) they are part of what he calls “the New Learning Paradigm” (Kivunja, 2014a: pp. 84-86) explained below.

### 2.1. The New Learning Paradigm

Kivunja (2014a) postulated that “Whereas pre-21st century learning paradigms catered reasonably well for the pursuit of the moral purpose of education in turning out school leavers with specialized skills that were applicable in highly compartmentalized and specialized Industrial Age economies, 21st century skills require a new paradigm” (p. 81).... Teaching our students so that they become well-equipped with the 21st century skills is the new learning paradigm” (p. 85). To extend an understanding of the meaning of the New Learning Paradigm Kivunja (2015a) explains that:

The New Learning Paradigm is the new philosophical approach to pedagogy which posits that for education to truly meet “the moral purpose of education and help produce citizens who can live and work productively in increasingly dynamically complex societies” (Fullan, 2000: p. 4), learning, teaching, assess-



ment and curricula need to equip graduates with the skills that will enable them to contribute effectively to productive capacities of the 21<sup>st</sup> century economy. These are the skills demanded by employers across all sectors of modern economies. (p. 55, in Press)

The full set of those skills is well articulated by The Partnership for 21<sup>st</sup> Century Skills (P21, 2008) in what they call the “*Rainbow*” or *Framework for 21<sup>st</sup> Century Skills* (P21, 2011) outlined below.

## 2.2. The Rainbow or Framework for 21<sup>st</sup> Century Skills

As explained earlier (see Section 1), The Partnership for 21<sup>st</sup> Century Skills is an organization that was formed in 2002 to find ways and make recommendations for how technology could be infused in all aspects of education throughout the USA at both primary and secondary levels (P21, 2008). The Partnership comprises leaders from education, (such as the National Education Association), business, (such as Apple Computer Inc., Dell Computer and Microsoft Corporations), and community and government institutions, (such as USA Department of Education), that play key roles in education and in the development and use of modern technologies, particularly digital technologies, in education (P21, 2014). When The Partnership met in Washington DC in 2002 they came up with a vision for moving USA education system to the digital world and epitomized it in what they called the *Rainbow* or *Framework for 21<sup>st</sup> Century Skills*. In their words:

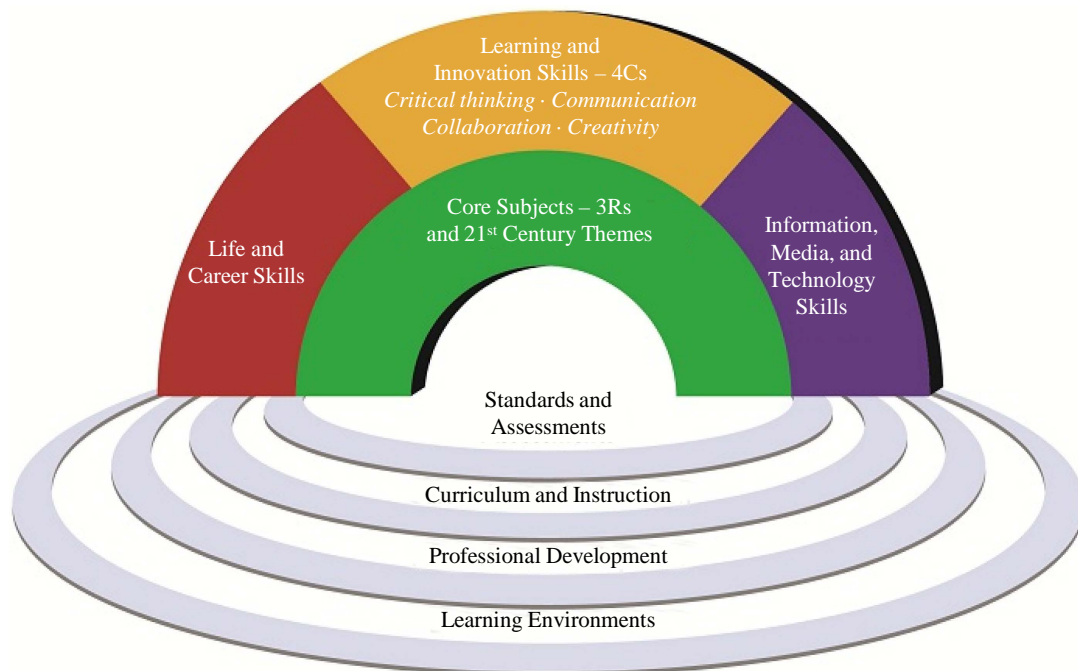
The Framework presents a holistic view of 21st century teaching and learning that combines a discrete focus on 21st century student outcomes (a blending of specific skills, content knowledge, expertise and literacies) with innovative support systems to help students master the multi-dimensional abilities required of them in the 21st century and beyond. (P21, 2015b: p. 1)

Their vision articulated four sets of skills representing 21<sup>st</sup> student outcomes and four 21<sup>st</sup> century learning support systems which The Partnership agreed on as those that would equip graduates from American schools with the skills essential for their success as productive members of the workforce in the Information Age. They articulated the four sets of skills as the traditional Core Subjects skills, the Life and Career skills, the Learning and Innovations skills as well as the Information, Media and Technology skills, supported by four systems, (P21, 2011). The Partnership summarized the four sets of skills and the four support systems in a graphic that they called the “*Rainbow*” or *Framework for 21<sup>st</sup> Century Skills or Learning* (P21, 2015b: p. 1) which is illustrated in **Figure 2**.

The Partnership says, and as shown in the **Figure 2**, “The key elements of 21st century learning are represented in the graphic... The graphic represents both 21st century student outcomes (as represented by the arches of the rainbow) and 21st century learning support systems (as represented by the pools at the bottom). Thus, in addition to the four sets of 21<sup>st</sup> century student outcomes for the necessary skills delineated above, there are four sets of 21st century Support Systems shown in **Figure 2** (as the pools at the bottom) categorized by The Partnership as Standards and assessments, Curriculum and instruction, Professional development and Learning environments. Not detailed in the *Rainbow* (**Figure 2**) but important to point out are what The Partnership refers to as the five Interdisciplinary 21<sup>st</sup> Century Themes, which must be interwoven with the Core Subjects in preparing students for effective participation in the Knowledge Age economy. They delineated those five themes as, “Global awareness, Financial, economic, business and entrepreneurial literacy, Civic literacy, Health literacy, and Environmental literacy” (P21, 2015d: p. 1). A detailed discussion of what the Core Subjects are, the four Support Systems and the five Interdisciplinary Themes is given in Kivunja (2015a, in Press). The skills that comprise the Life and Career set were discussed in detail by Kivunja (2015b), those in the Learning and Innovations skills were unpacked in Kivunja (2014b) and those that comprise the Information, Media and Digital Technologies skills were elucidated in Kivunja (2015c). Thus, the 4Cs are part of the full cohort of 21<sup>st</sup> century skills as illustrated in **Figure 2**. As said earlier, “Teaching our students so that they become well-equipped with the 21st century skills is the New Learning Paradigm” (Kivunja, 2014a: p. 85).

## 3. What Are the Pedagogical Implications of the 4Cs Super Skills?

As illustrated in **Figure 2**, the 4Cs super skills sit right at the apex of the *Rainbow* or *Framework for 21<sup>st</sup> Century Skills*. And as discussed in Section 1 above, they are essential for success of our students on their graduation into the world of real work and life. In view of their significance to humans in all walks of life it is crucial, for the achievement of “the moral purpose of education” (Fullan, 2000: p. 4), that we pedagogues review how we



**Figure 2.** The rainbow or framework of 21<sup>st</sup> century skills (source: P21, 2015b).

can shift in our cultural and cognitive modes so as to transition our pedagogical structural, cultural and organizational dynamics (Kivunja & Power, 2006) to ensure that our graduates will be well equipped in these 4Cs super skills by the time they graduate to take up productive roles in the 21<sup>st</sup> century workplace. This section addresses the question: How can the 4Cs super skills be taught, learnt and assessed effectively, particularly using a well proven model such as Bruner's 5E Instructional Model? Of course there are many excellent instructional models (e.g. Bloom, 1956; de Bono, 1956; Gardner, 1983; Vygotsky, 1978), but Bruner's model is selected here for illustrative purposes because it appears to capture very well the important contributions of these other giants in the field, particularly when it comes to providing a scaffold that facilitates students' active construction of knowledge. But, admittedly, other models could also offer excellent material for further illustration with regard to the teaching of the 4Cs super skills. So, let's start by highlighting what is known in pedagogy as Bruner's 5E Instructional Model (Kivunja, 2015d) (Note the common use of 5E rather than 5Es for this model).

### 3.1. Bruner's 5E Instructional Model

What is popularly referred to as Bruner's 5E Instructional Model is a learning cycle with a very interesting history. The model has its origin in science rather than pedagogy. It is the brainchild of a leader in the biological sciences community Dr. Rodger W. Bybee (Bybee et al., 2006) who, while executive director at the Colorado Springs Biological Science Curriculum Study (BSCS) Educational Centre, developed it in collaboration with six of his colleagues. Bybee and his team argued that if we could get learners to engage, explore, explain, elaborate, and evaluate as they learn, these processes would enable them to maximize their participation in active learning and lead to deep (Entwistle, 2000; Flewelling & Higginson, 2002) rather than surface learning (Lublin, 2003). Because each of these five learning processes starts with the letter [e], the model was accordingly called the 5E Instructional Model.

The huge success of this model when applied in teaching science attracted scholars outside science of whom Jerome Seymour Bruner (1966) was the pedagogical vanguard. In *The Process of Education* Bruner (1960) argued that the purpose of education was not simply to transmit knowledge but mainly to facilitate the process of active cognition and the development of problem solving skills among learners, which the learners could then apply in similar or new situations to gain new knowledge, through active learning. Bruner (1961) further proposed the concept of *discovery learning*, which, like Vygotsky (1929) postulated that students learn through constructing knowledge by themselves and argued that this constructivist approach was maximized if students were scaffolded

and given opportunity to discover meaning by themselves through engagement, exploration, explanation, elaboration and evaluation. Bruner then made this, 5Es based constructivist learning even more popular in pedagogy by suggesting that with proper “scaffolding” (Wood, Bruner, & Ross, 1976) the learners could use the 5Es to “concentrate on the difficult skills...in the process of acquiring knowledge” (Bruner, 1978: p. 19). Thus, the 5E Instructional Model became very popular in pedagogy because Bruner showed how it could be used to facilitate learning as conceptualized by several leading scholars in the field (including himself), through active learning (Piaget, 1954), constructivist learning (Vygotsky, 1929), discovery learning (Bruner, 1961) and scaffolding (Wood, Bruner, & Ross, 1976). As a result, while acknowledging the origin of this model in the biological sciences, it is fair to say that Bruner was at the forefront of its understanding and application in pedagogy. As it is one of the well-known instructional models in education, and one that reflects the important contributions to pedagogy by the vast majority of experts in the field, including “aspects of the behaviourist and cognitivism models” (Jobrack, 2013: p. 5), it makes good sense to use it here to illustrate how we could teach the 4Cs super skills in today’s classrooms and lecture theatres. As said earlier, this does not mean that other models could not be used.

### 3.2. Utilizing Bruner’s 5E Lenses to Teach the 4Cs Super Skills

For brevity, the illustration of how each of Bruner’s 5Es could be used to teach each of the 4Cs is summarized in the following five tables, respectively. The examples are listed against the relevant Cs but with imagination, planning and differences in learning stages the examples could be used for multiple Cs.

#### 3.2.1. Utilizing the Engagement Lens to Teach the 4Cs

The Engage lens of Bruner’s 5Es model focuses on maximizing student’s participation in active learning through actively engaging with the learning tasks, ideas or concepts (Bruner, 1966). **Table 1** summarizes examples that could be used to maximize learners’ engagement with each of the 4Cs super skills.

#### 3.2.2. Utilizing the Exploration Lens to Teach the 4Cs

The Explore lens focuses on providing scaffolding to students and then letting them venture into new areas with you scaffolding and guiding their explorations. **Table 2** illustrates some examples of activities which can be given to students to offer them opportunities to explore what they are learning.

#### 3.2.3. Utilizing the Explanation Lens to Teach the 4Cs

The Explanation lens focuses on information that is new or that students are unlikely to find by themselves. It focuses on elucidation of ideas and concepts and interpretation that extends students’ understanding to new knowledge frontiers. It zeroes in on “concerns that students might miss or experience cognitive overload or even develop misconceptions” (Jobrack, 2013: p. 7) if left on their own. **Table 3** illustrates students’ activities involving explanation.

#### 3.2.4. Utilizing the Elaboration Lens to Teach the 4Cs

The Elaboration lens is also called the Extend lens (Jobrack, 2013: p. 8). It is used to give students the opportunity to extend their cognitive experiences into areas of increasing complexity. It allows students to connect current schema to new learning and to focus deeper so as to be able to elaborate on what they have already learnt or on new knowledge discovered. Reigeluth (1999) says that this lens can be used by the teacher to help students focus on new and more complicated concepts, and asking students to expand and elaborate on them. Students’ activities involving elaboration are illustrated in **Table 4**.

#### 3.2.5. Utilizing the Evaluation Lens to Teach the 4Cs

The Evaluation lens can be used to give students the opportunity to focus on their current performance to determine how they are achieving the learning outcomes or not, and what they can do to improve their achievement. So, it can be a very good lens for students’ self-assessment and formative assessment. It can also be an excellent lens for summative assessment to inform the teacher on strategies and planning needed to improve teaching, learning and assessment, and to make changes as informed by the Evaluation lens (Anderson, 2003). Examples of students’ activities utilizing the evaluation lens are shown in **Table 5**.

**Table 1.** Teaching the 4C's super skills through Bruner's *E1: Engagement Lens*.

4C super skill	Examples of <i>Engagement</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> <li>• Tell how and why previous learning is relevant to the present topic.</li> <li>• Connect your to new learning</li> <li>• Agree or disagree over an issue and give reasons for their position.</li> <li>• Conduct a debate to defend your position or stance about an environmental issue in the community</li> <li>• Use Internet resources to illustrate and communicate original ideas and stories</li> </ul>
Communicating	<ul style="list-style-type: none"> <li>• Discuss why previous knowledge is essential for current learning</li> <li>• Actively/attentively listen to each other's point of view</li> <li>• Ask questions on the topic</li> <li>• Illustrate and communicate you original ideas using digital technologies.</li> <li>• Communicate information which helps fellow students to troubleshoot a new software to increase its efficiency</li> </ul>
Collaborating	<ul style="list-style-type: none"> <li>• Work as a team to complete K-W-H-L chart               <ul style="list-style-type: none"> <li>◦ K: What each one knows</li> <li>◦ W: What each team member wants to know</li> <li>◦ H: How each member will find relevant data</li> <li>◦ L: What each team member will have learnt</li> </ul> </li> <li>• Working in teams of 5 search the Web for data and discuss how it relates to the topic</li> <li>• Engage in learning activities with students in overseas countries</li> </ul>
Creating and innovating	<ul style="list-style-type: none"> <li>• Students engage in inquisitive activities</li> <li>• Respond to "what if" type of questions</li> <li>• Come up with an answer different to the one given</li> <li>• Design your own questions for the class to answer</li> <li>• Work individually or in a team and use digital tools to compose a digital story</li> </ul>

Source: Application of Bruner (1960, 1961, 1966; NETS, 2007) to personal professional practice over 30 years as synthesized in Kivunja (2015d).

**Table 2.** Teaching the 4C's super skills through Bruner's *E2: Exploration Lens*.

4C super skill	Examples of <i>Exploration</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> <li>• Students venture into new areas of research</li> <li>• Given time and opportunity for metacognition</li> <li>• Attempt new experiments to discover new reactions and results</li> <li>• Conduct Internet searches and use the data to explore a particular life cycle</li> <li>• Conduct a study of a nature strip</li> <li>• Go on a virtual excursion</li> <li>• Go on a study field</li> </ul>
Communicating	<ul style="list-style-type: none"> <li>• Talk about relationships among ideas, concepts and themes</li> <li>• Discuss misperceptions and correct misconceptions</li> <li>• Probe for deeper understanding</li> <li>• Conduct a whole-class discussion on a controversial topic</li> <li>• Watch a video clip and discuss message it conveys</li> <li>• Discuss the safe use of the Internet</li> </ul>
Collaborating	<ul style="list-style-type: none"> <li>• Work in teams to study a new topic</li> <li>• Given opportunity to monitor and scaffold each other</li> <li>• Use the Internet to form peer learning networks with classmates.</li> <li>• Use the Internet to form virtual learning communities using Google Circles tools</li> <li>• Complete assessment tasks with learners in different countries, connected by the Internet</li> <li>• Work as a team to conduct a science experiment</li> </ul>
Creating and innovating	<ul style="list-style-type: none"> <li>• Take time to reflect and come up with a new idea.</li> <li>• Come up with a different opinion about what has been covered previously.</li> <li>• Use new Urls to find new learning resources and use them in class activities</li> <li>• Download useful resources from YouTube and use them to design something new</li> <li>• Create a curriculum-specific simulation that will encourage your peers to practise critical thinking</li> </ul>

Source: Application of Bruner (1960, 1961, 1966; NETS, 2007) to personal professional practice over 30 years as synthesized in Kivunja (2015d).

**Table 3.** Teaching the 4C's super skills through Bruner's *E3: Explanation Lens*.

4C super skill	Examples of <i>Explanation</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> <li>• Demonstrate how something works</li> <li>• Set up an experiment and explain to the class how it works</li> <li>• Explain how past learning links to new knowledge</li> <li>• Look for and explain patterns in data</li> <li>• Use a Venn graphic organizer to explain the differences and commonalities in data</li> <li>• Apply previous knowledge to resolve a current software problem</li> </ul>
Communicating	<ul style="list-style-type: none"> <li>• Explain to the teacher personal understanding of an idea, concept, or issue</li> <li>• Reinforce, support or challenge what has been said</li> <li>• Conduct an interview and report the outcome to the class or topic</li> <li>• Describe the results of an experiment</li> <li>• Present a report to the class of a field trip.</li> <li>• Explain the meaning of a plot in the story they have just read</li> <li>• Describe and illustrate a concept using a model</li> </ul>
Collaborating	<ul style="list-style-type: none"> <li>• Conduct a Round-Robin of Four-Ways-Interviews and then discuss among your team the ideas generated by the interviews</li> <li>• Question each other and probe each other's contribution to develop a deeper and fuller explanation and understanding</li> <li>• Challenge each other's contribution to the team by asking them to explain further</li> <li>• Use the Think-Pair-Square cooperative learning structure to explain a topic to your team-members</li> <li>• Encourage equal participation in explaining something new</li> </ul>
Creating and innovating	<ul style="list-style-type: none"> <li>• Link past event to new learning occurrences</li> <li>• Develop a hypothesis to be tested</li> <li>• Come up with a new theory to replace an existing one</li> <li>• Create a glossary of terms from the topic learnt and explain them to the class</li> <li>• Compose a narrative and explain it</li> <li>• Use digital-imaging technology to create a graphic to be used in a digital presentation.</li> </ul>

Source: Application of Bruner (1960, 1961, 1966; NETS, 2007) to personal professional practice over 30 years as synthesized in Kivunja (2015d).

**Table 4.** Teaching the 4C's super skills through Bruner's *E4: Elaboration Lens*.

4C super skill	Examples of <i>Elaboration</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> <li>• Look for deeper meaning of concepts they are introduced to</li> <li>• Search the Internet for further points connected to or are relevant to what is being learnt</li> <li>• Challenge current understanding</li> <li>• Questioning and correct misperceptions</li> <li>• Apply what is taught to solve new problems</li> <li>• Apply theory to real-life experiences</li> </ul>
Communicating	<ul style="list-style-type: none"> <li>• Talk more about a topic that has been discussed previously</li> <li>• Practise using formal language correctly</li> <li>• Discuss extension of a concept</li> <li>• Describe and demonstrate a process</li> <li>• Share your understanding of how a digital learning game helps learning</li> <li>• Create a media-rich presentation and share it with other students</li> </ul>
Collaborating	<ul style="list-style-type: none"> <li>• Challenge peers in a team to tell more</li> <li>• Work in a team to broaden what is being learnt</li> <li>• Share understandings of what has been learnt</li> <li>• Work together to solve a problem.</li> <li>• Publish to all members of your virtual community a problem you have encountered when learning and seek their assistance</li> </ul>
Creating and innovating	<ul style="list-style-type: none"> <li>• Raise new issues for discussion</li> <li>• Apply skills learnt to new contexts</li> <li>• Extend current learning to new areas</li> <li>• Apply knowledge learnt in one Key Learning Area (KLA) to several other KLAs</li> <li>• Design and complete a rich learning task</li> <li>• Telegraph new ideas</li> <li>• Develop and use new terminology</li> <li>• Try new skills</li> <li>• Practice injury prevention in the playground at your school by drawing up a few simple rules</li> <li>• Create a video documenting a community event in which your class or school participated</li> </ul>

Source: Application of Bruner (1960, 1961, 1966; NETS, 2007) to personal professional practice over 30 years as synthesized in Kivunja (2015d).



**Table 5.** Teaching the 4C's super skills through Bruner's *E5: Evaluation Lens*.

4C super skill	Examples of <i>Evaluation</i> student activities
Critical thinking and problem solving	<ul style="list-style-type: none"> <li>• Reflect on what they have learnt and discuss its value in real life</li> <li>• Complete a Plus, Minus, Interesting (PMI) model of an topic they have learnt</li> <li>• Debate a current controversial issue at the school or in the community</li> <li>• Link or show connections between current class work and solving problems in the world beyond school</li> <li>• Complete a Cost-Benefit Analysis of an issue</li> <li>• Complete a self-assessment exercise following the completion of a major task or project</li> <li>• Review how you have achieved the learning outcomes</li> <li>• Recognize bias in resources available on the internet</li> </ul>
Communicating	<ul style="list-style-type: none"> <li>• Demonstrate masterly of certain learning in an oral presentation</li> <li>• Discuss the evaluation of a particular task</li> <li>• Evaluate digital resources for use in a named topic and discuss your findings with the class</li> <li>• Publish online your artwork with commentary that demonstrates your understanding</li> <li>• Select a set of digital tools and justify their value in completing a task</li> </ul>
Collaborating	<ul style="list-style-type: none"> <li>• Complete peer assessment for members in your team</li> <li>• Mentor each other in a team and provide feedback</li> <li>• Use the Kagan's (1994) Jig-Saw structure to evaluate a story</li> <li>• Work in teams to complete the Kivunja (2015) Star Graphic Organizer (What-Who-Where-When-Why-How) to evaluate a given topic</li> <li>• Use collaborative electronic tools to evaluate the topic or unit completed</li> </ul>
Creating and innovating	<ul style="list-style-type: none"> <li>• Complete a SWOT Analysis (Strengths, Weaknesses, Opportunities, Threats) of a new proposal for changes to a unit they are about to start</li> <li>• Use formative assessment to improve performance</li> <li>• Create a personal portfolio and assess each others' portfolio</li> <li>• Show links between unit completed and the next one</li> <li>• Complete open-ended assessment tasks.</li> <li>• Use digital tools to analyze data and to evaluate a theory learnt</li> <li>• Design a model of legal and ethical behaviors when using the Internet</li> </ul>

Source: Application of Bruner (1960, 1961, 1966; NETS, 2007) to personal professional practice extending over 30 years as synthesized in Kivunja (2015d).

## 4. Conclusions

The Partnership for 21<sup>st</sup> Century Skills presented the 4Cs of critical thinking and problem solving, communication, collaboration, and creativity plus innovation, as the super skills in the 21<sup>st</sup> century because they are foundational essentials for success in college, university, career, and life outside educational institutions. On graduation, students will enter a highly competitive world of commerce, business and life that demands more skills than those evident in graduates of the Industrial Age. As rightly pointed out by Grovo (2015), 21<sup>st</sup> century industry requires “graduates with skills that will allow them to be immediately productive in the workforce” (p. 3). The 4Cs are super skills because they provide a core of skills which, when combined with the traditional Core Subjects skills, help students to develop and demonstrate a sound understanding and greater effectiveness and efficiencies in the Career and Life skills and the Information, Media and Technology skills all of which comprise the New Learning Paradigm.

But, the New Learning Paradigm is not just about the 4Cs, nor is it about just learning. It is about making a switch in learning, teaching, assessment and curriculum development to utilize all the elements of the *Rainbow* or *Framework for 21<sup>st</sup> Century Skills*. As discussed in this paper, this includes the four sets of skills representing students outcomes, the four supporting systems and the five interdisciplinary themes, all of which are needed to equip graduates with the skills that will enable them to contribute effectively to productive capacities in the 21<sup>st</sup> Digital Economy. Along this journey, the 4Cs are posited by the Partnership for 21<sup>st</sup> Century as the fuel that not only accelerates the achievement of the different elements of the *Rainbow*, but energizes participants in the pursuit of these elements. The 4Cs add value to human endeavor in the development of the different elements of the *Rainbow* and are therefore super skills, because as can be inferred from Michael Woolcock (1998, 2001), of what value is human enterprise if it does not add to social capital?

In their wisdom, The Partnership (P21) chose the metaphor of the *Rainbow* to represent the elements of the



*Framework for 21<sup>st</sup> Century Skills*. This appears to be a very prudent choice because it serves to emphasize the integrative and holistic nature of all the elements that together comprise the *Framework for 21<sup>st</sup> Century Skills*. Just like no *Rainbow* would be complete without some of the essential colors, the *Framework for 21<sup>st</sup> Century Skills* would not be complete unless the four sets of students' outcomes, the four supporting systems and the five interdisciplinary themes are all considered together. By way of reiteration as this paper concludes, the philosophical approach which posits that learning, teaching, assessment and curriculum development all need to include these 21<sup>st</sup> century skills of the *Rainbow* is what Kivunja (2014a) calls the New Learning Paradigm.

The *Rainbow* is a well-conceptualized model representing the Partnership's vision for success in 21<sup>st</sup> century studying, the professions, trades, industry and living. The location of the 4Cs at the summit of the *Rainbow* (please refer to **Figure 2**) is not accidental. It serves to highlight the position of the 4Cs super skills within the entire structure. These skills are super skills because they are essential to help students develop skills for increased productivity, creativity, critical thinking, problem solving, communication and collaboration, not only while still at college but even more importantly, later in their daily lives after graduation. These skills have always been essential for success but as Gardner (2000) says, now "technology brings them to our fingertips...the new technologies can really come into their own... With new software and the World Wide Web, it is possible to receive and to manipulate all kinds of (hopefully accurate) data, captured in a wide range of symbol systems, and evaluate respective claims and counterclaims" (p. 34) to enhance the power of the 4Cs super skills to influence the other elements of the *Rainbow*. The teaching of these 4Cs super skills within the New Learning Paradigm will help to educate graduates who will succeed in the real world of work. This is vital if education is to achieve its moral purpose—for, as can be inferred from Fullan (2000), of what value is education if it does not lead to the achievement of the moral purpose of education?

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# Case Study of Children of Referrals to Health Services: An Individualizing Design?

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## Abstract

Nowadays education for all is recommended as an international action. However in Brazil one can observe homogeneous practices for a heterogeneous public. When the student has learning difficulties, there seems to be an attempt to normalization and pathologization by the means of referral, many times being indiscriminate, to health services. This case study aimed to analyze records of pedagogical strategies to meet the students educational needs before sending them to health services. Two records sent to a multidisciplinary team of a Regional Specialty Clinic (ARE) in a city of the state of São Paulo/Brazil, were used. The results reflect that the records of the educators do not show the pedagogical strategies used with the students and that the education system still seeks homogeneous classes, devaluating the diversity present in its context.

## Keywords

Pathological, Diversity, Learning Problems, Health Services

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## 1. Introduction

In modern era, childhood begins to be seen as a time of preparation and prevention for the formation of productive and healthy individuals. It begins in this period, the interventions on childhood care from prevention settings, moralizing and educational practices. Thus, the establishment of the school appears as an expression of the very modern constitution of childhood (Guarido, 2010).

The school performance in modernity is related to the child's ability to remain quiet and seated. In order to meet these requirements the child needs to control and adjust their behavior (Seno, 2010). The school often requires students to pay attention to everything that is presented to them, even when, in most cases, the content does not make sense. Also that do not show irritation and restlessness even when the situation at school is un-



bearable (Meira, 2012). In addition, it is expected that children become independent, learn quickly and various contents and depend a little on adults who surround them (Rojas, 2010).

Students who do not meet the school requirements are usually labelled as sick, lazy or unmotivated, and referred to the healthcare services (Nakamura, Lima, Tada, & Junqueira, 2008). By labelling the student, the school does not recognize, does not reflect and does not act on their teaching practices, and ends up blaming only the child (Souza, Ignatius, & Carvalho, 2009). In this way the school ceases its function and produces problems that will be treated as demands for health in different social spaces as public and private health services, mental health and psychology clinics (Meira, 2012).

The difficulty on learning or behaving is currently designed by the school as an individual problem, as a personal failure (Beltrame & Boarini, 2013; Sanchez & Amarante, 2014). This belief makes these children to be subjected to a large number of examinations and tests seeking the biological cause of the difficulty on learning or behaving (Sanches & Amarante, 2014). The relationship between neurological problems, learning problems and behavior becomes, then, is increasingly common in school referrals to public and private services in the health field (Meira, 2012).

Referrals made by the school disregard existing conditions and situations in the school environment (Nakamura et al., 2008). Still in modernity, the relationships developed between teachers and students generate dependency links that are often pathologizing to produce alienation and frustration in both parties (Meira, 2012). An example of this gap in student-teacher ratio is the idealization of a perfect student. Currently there is a disharmony between the real and the ideal student. The teacher who idealizes students is generating a difficulty of dealing with behavior that contrasts with the idealized posture, and the traditional education system collaborates with the illustration of the existence of a perfect student. Therefore, the student who does not meet the expectations tends to be worked to fit the school environment (Landskron & Sperb, 2008).

Teachers, who have greater contact with students, are the ones that identify symptoms and refer to health services; the main complaints made by these professionals are behavior and learning difficulties in the classroom. (Souza & Mosmann, 2013). About it, Guarido (2010) states that the knowledge of psychology, influenced by modern medicine, enabled the teachers to become extensions of an expert look in everyday practice since they come to observe the children's behavior changes and guide their family in the search for appropriate treatments to the problems presented by the students in the school.

According to Sanches and Amarante (2014) there was an increase in referral of children to mental health services with social demands. Research done in 2013 supported this claim. The researchers Beltrame and Boarini (2013) reported that in a Children and Youth Psychosocial Care Center (CAPSi) in the state of Paraná, there was an increase of children of referrals to health services. About 60.0% of cases were referred by the school, the main complaints learning problems and behavior in schools. Souza and Mosmann (2013) report that about 15.5% of the demands of a CAPSi in São Paulo refer to academic problems.

The main behaviors that generate referrals are inattention and restlessness. These behaviors produce discomfort in various contexts, but it is at school where most calls their control (Landskron & Sperb, 2008). According to Nunes, Tank, Costa, Furlan and Schnell (2013) referral of children to psychology clinics done by schools is the most frequent demand in psychological clinics in Brazil, the main reason for this routing Deficit Disorder and Attention hyperactivity disorder (ADHD). Thus, the school acts more as a space for diagnosis than a pedagogical space (Sanches & Amarante, 2014).

## 2. Subjectivity of School Records: An Issue to Be Thought

According to Landskron and Sperb (2008) the records made by teachers show that the referral of children for mental health service with learning difficulties occurs without first these children be evaluated pedagogically. Being so, the researchers describe how it is questionable how diagnoses are made, since they are based on subjective interpretations of parents and teachers on children's behavior. Still, an analysis of records made by Sanches and Amarante (2014) reports that the school decreases the workload of children with inappropriate behavior within the school as a way of pressuring parents to solve the problem. With this attitude, the school environment was more punitive and remiss than welcoming.

The school believes it has exhausted all the possibilities of working with the difficulties of the student when the sends for ealth, but the institution does not thinks on their practices, blaming only the child (Beltrame & Boarini, 2013). Methods, resources and homogenizing pedagogical practices are not questioned, ignoring the



diversity present in school. Each student is unique, his/her personality, his/her way of expressing satisfaction or dissatisfaction with the system must be respected. Blames on him/her for the failure of the education system is hurting the Universal Declaration of Human Rights of 1948 (UNESCO, 1998a) which states that “everyone has the right to education”; the Convention on the Rights of the Child (Brazil, 1990) that in Art.28, item “d” professes that it is the state’s duty to make information and educational guidance available and accessible to all children; the World Declaration on Education for All (UNESCO, 1998b) which underlines the importance of expanding educational approach, expressing what it takes “universal access to education and promoting equity; to focus on learning; broadening the means and the basic education sphere of action; provide a suitable learning environment; strengthen alliances.” (p. 4). Note that the approach focuses on the delivery of education to students and the restructuring of the education system recognizing “that, in general terms, the education that is provided today has serious shortcomings, which is needed to make it more relevant and improve its quality, and that it should be universally available” (p. 3). In addition to being a signatory of these international actions, Brazil also has the Statute of Children and Adolescents—ACE (Brazil, 2009), which in Article 54, Paragraph §2 states that the “irregular supply of teaching matters for the Competent Authority” (p. 33).

In this context, Copetti (2012) brings to discussion the question “What is ‘try everything’?” (p. 17), where it says “traditional medical examinations may, at most, diagnose medical problems that are very probably related to learning problems, such as a brain tumor, for example, [...] however, do not diagnose deficits underlying the learning problems, which ultimately are truly causing the school problem.” So when the doctor says *there is nothing wrong with the examination of the child*, family and/or school questions—why not? If he does not learn! if he/she does not stop! if he/she does not pay attention! and, failing that health/disease, then considers the child “lazy”, “disinterested”, or any other pure and simply belonging to the child (Copetti, 2012).

On the other hand, when the diagnosis occurs, the school ratifies it, accepting and reproducing the medical discourse (Brzozowski & Caponi, 2009). The medical diagnosis is seen, at school, as unquestionable and its guidelines are received as order by teachers (Landskron & Sperb, 2008), resulting in a justification for the fact that the student does not learn.

Of particular concern is the issue related to the diagnosis of ADHD and High Abilities/Giftedness. Antshel (2008) explains that students with an IQ above 140 can be misdiagnosed as having ADHD since they have similar characteristics, such as focused attention only in areas/topics of interest and vulnerability to boredom that do exhibit behaviors considered to be inappropriate in the environment school. In these cases, a misdiagnosis could result in medicalization of a highly talented student, dulling their potential and exempting educators to invest in diversified educational practices.

Considering these notes, one might think then natural of acceptance of an analysis which revealed a problem with the student, since this is more acceptable, since “return” the case to the school without a possible solution, other than a “disease/disorder”, would show a weakness in the school system, which is not “welcome”. Thus it is not a surprising increase in the prescription of drugs for the treatment of students (Guarido, 2010; Landskron & Sperb, 2008; Meira, 2012).

Reinforcing this view, Sanches and Amarante (2014) say that parents and teachers demonstrate a lack of discussion on the conflicts that occur in schools through the records. Further, according to Nakamura et al. (2008), the teachers often report records their efforts to assist in learning or to control the student in the classroom. And to what extent will these efforts go?

In search of answers we undertook this study<sup>1</sup> to analyze in two records, referred to a multidisciplinary team of a Regional Specialty Clinic (ARE), in a city in the state of São Paulo with just over 400,000 inhabitants, teaching strategies records to meet the educational needs of students before forwarding them to health services.

### 3. Casuistry

The case study was accomplished in two medical records forwarded to the ARE, one by a Pedagogical Coordinator, attesting to the evaluation of the teacher, and the other by the teacher. It is boys’ records at the time of the study, the in third and fourth grades of elementary school, respectively. To maintain confidentiality on the identity of the students, they will be identified by X and Y, respectively. In addition, to preserve school’s identity, educational coordinator and teacher chose not to photocopy the records, however, faithful and fully transcribe

<sup>1</sup>This study was approved by the Ethics Committee of the Institute of Biosciences, Arts and Exact Sciences—UNESP/SJRP on September 12, 2011 under the advice of n° 076/11.

their content:

*“X is 8 years old and is enrolled in this school unit since May 2011 attending the 3rd year of elementary school. **The student is participating, has quiet a behavior, is shy and gets a lot of sense when a colleague makes comments about him or his work.** As for school performance, especially this school year, has shown interest and a desire to overcome his difficulties. In [relation to] writing and reading development he has less than expected. In dictation he demonstrates to be in the alphabetical stage, but to prepare a text or a sentence, he has great exchange of letters, confuses not only the neighboring phonemes (f/v, p/b) placing letters at random leaving writing sometimes incomprehensible. In reading comprehension, when reading alone, he cannot have clarity of the proposed activities. In oral he expresses opinions only when asked. In mathematical reasoning there were great advances, the student can perform the operations and problem situations when the statement is read by the teacher. **The teacher reports that after stopping the medication the student had more difficulties both in mathematical reasoning as in reading and writing. He presented tiredness, sluggishness and lack of concentration.** There is great concern in part of the regular teacher and ESA’s service teacher [Educational Service Specialist], because X sometimes demonstrates a great advance while other times he seems to regress and does not match with which is required.”* (Our italics)

*“Y is 9 years. He presents writing with round hand letters (all tied up), but he can make reading his writing. He does not perform the activities proposed in the classroom, but he has a good oral understanding. Because he does not carry out the activities, he stays observing the colleagues, he expresses verbal aggression, especially in relation to colleagues’ parents and grandparents. **He stands up all the time from his place to sharpen pencil, to get glue, scissors, for any or no reason, he leaves the place throwing down materials from colleagues, he kicks, slaps, etc. He does not focus on activities, he has no patience to listen to explanations, he makes jokes, he questions real facts and he tries to twist them.** When asked, he denies his attitudes, he screams and cries. He has a habit of biting his tongue, he chews all that he meets: pencil, plastic rubbers, clothes, etc. **In an attempt to improve, he was changed from the classroom where he remained for a month and a half. Unfortunately there was no progress and he returned to the original room.** There are no changes in his behavior, he is less and less performing the proposed activities. **The mother is always present** and follows the incomplete activities, asking him to accomplish them at home.”* (Our italics)

## 4. Results and Discussion

For the presentation of results and discussion, we created categories of analysis as presented in italics description of the records, which we present below.

### 4.1. The School behind the Records—Description of Students: An Individualizing View

The two charts bring different complaints of his students to the area of health. The first describes *the student shares the activities, he has a quiet behavior, is shy and gets a lot of sense when a colleague makes comments about him or his work.* There is a behavioral complaint in this case, since the student does not present behaviors considered socially inadequate, but the school forwards the student to the health area seeking answers for absence on learning.

The second chart depicts that *the student does not focus on the activities, he has no patience to listen to explanations, he makes jokes, he questions real facts and he tries to twist them.* Here the behavior displayed by the student bothers educators who tend to refer its origin to his family, however, *the mother is always present*, in an attempt to find answers for the absence of learning and for behavior considered inappropriate, the solution was to direct him to health services, focusing the problems on the student himself.

According to Masini (2013), educational professionals knowledge is omitted when seeking to classify learning disability looking for something of organic order. Similarly Guarido and Voltolini (2009) in a psychoanalytic and grounded in Foucault debate, argue that there is a disclaimer from teacher to consider that absence of learning is due to physical problems, leaving “few gaps for that education to be seen as a link between adults and children that can result in some kind of transformation” (p. 255).

To change this logic inculcated in the educational setting, one needs to rebel against the process of teaching and learning, considering the diversity of students present at school, valuing the diversity in this social context. However, “rather than rebel against teaching and its structure, the East prefers, however, to remedy the consequences of the anomalies generated by inadequate teaching of our time. Remedy the effects means, in this case,

to instruct medicine to answer where teaching failed” (Mannoni, 1988: p. 49).

The homogeneous model shows to be inappropriate at school for everyone, recommended by the World Declaration on Education for All (UNESCO, 1998b). We have overcome the vision of the elitist school, although without all that the developing countries require, as it is the case of Brazil. The school for all requires a broad view of the school context and of the singularities in which it is engendered. A school is different from another, a student is different from the other, which makes us question—How to use the same teaching strategies for different populations? As a different student in his/her needs and potentialities can learn if the education system still favors homogeneity?

One needs to value the diversity of our children which, according to Machado (2013) start the multiplicity of livings through questions, trials and curiosities, but this is rebuked in the current logic of ruling operation of schools. Multiplicity of experiences becomes to be unwanted and becomes controlled, so such full development would not be harmed? Although, we have not opted for an approach to the discussion in this study. We believe that a Vygostki’s historical-cultural perspective, development occurs through learning and this in turn happens in the social context to which a person lives; thus we can argue that in an environment where the child is prevented from experience through social relations, from different forms of expression, his/her development would be harmed or at least minimized to what it is expected from her—not excel standardization.

#### 4.2. In the Classroom: The Pathologizing Relationships Established at School

According to the school, X *presented tiredness, sluggishness, lack of concentration* and, Y, *raises all the time from the place for sharpening pencils, to take glue, scissors, for any or no reason, he leaves the place, throws down materials from colleagues, kicks, slaps, etc.*

Here we ask: what kind of student is school looking for? We observed the reinforcement of studies by Sanches and Amarante (2014), Beltrame and Boarini (2013) and Souza and Mosmann, since referrals to health services have difficulties related to schooling, which we can infer to be associated with an unthinking social demand and on pedagogical practices of a traditional school, but without an ideal student seeks alternatives to its regulation (Landskron & Sperb, 2008).

To Masini (2013), the school needs to understand and accept that children daily receive a variety of information in real time by means of communication; this makes them to produce divergent behavior from the one awaited by the school. It appears, then, according to Rojas (2010) that the requirement level of the stimulus generated by the media can produce a hyperactive, inattentive as well as and impulsive child, once the ideals emerging regarding immediation and urgency on the part of contemporary society, do not favor the development of ideas as delaying, waiting and thinking of a future order. Thus, the school demands some children’s behavior and society encourages and produces other forms of behavior.

#### 4.3. Prescription Drugs: A Solution to Unexpected Behavior in the Classroom

It is observed in the first chart that *the teacher reports that after stopping medication, the student had more difficulties both on mathematical reasoning as on reading and writing.* Ferrazza and Rocha (2011) state that, from the moment when psychological distress is labelled as a pathology, a biological disease, treatment happens only by prescription of psychotropic drugs. To Crochik and Crochik (2010) this is because health professionals try to solve school problems outside the institution, failing to observe the influence of the school environment on children. Still, Eidt and Tuleski (2007) say that often drugs are used as a tool to create normal standards. The authors believe that medication prescription is an attempt to build someone without conflicts, anguish and limitations. Therefore, according to Machado (2013), medicalization process in school decreases singularity and the process of differentiation on children at school, as the attempt to homogenize students shows.

As for the second chart, it does not describe if the student makes use of medication, but studies in recent years (Brant & Carvalho, 2012; Crochik & Crochik, 2010; Guarido, 2010; Eidt & Tuleski, 2007; Ferrazza & Rock, 2010; Landskron & Sperb, 2008; Machado, 2013; Meira, 2012) on behaviors of agitation and impulsivity in schools make us infer that possibly this child will be medicated. This happens, according to Crochik and Crochik (2010), because the problems witnessed in the school are understood as physical or psychological and, therefore, deserve to be treated with medication and psychotherapy.

Decotelli, Bohrer and Bicalho (2013) lecture on medicalization during childhood and biopower spheres discussed by Foucault. The authors say that Brazil is the second largest consumer of Ritalin, a drug indicated for

the treatment of ADHD, which was renamed as the “obedience drug” as it provides opportunities for educators to solve the difficulties presented in school, that is for the behaviors considered to be inappropriate to the school environment. Guarido and Voltolini (2009), expressing concern and rejection to this model that aims to pathologizing human experiences in order to control what comes out of the norm, so sadness turns into depression, anguish and anxiety disorder, problems with writing in dyslexia, agitated behavior in ADHD, and (unfortunately) among other examples.

What draws our attention is the “possible” solution that the school had taken to resolve the student Y’s difficulties: *In an attempt to improve, we changed Y’s classroom, where he remained for a month and a half. Unfortunately there was no progress and he returned to the original room.* We observed that the reports of medical records do not describe the teaching strategies used with students, to find those that best suited for them, which contradicts Nakamura et al. (2008) when they say that teachers report in the medical records their efforts to promote student learning. Here we cannot say that such attempts did not exist, however, we can argue that the records do not bring this important information which could also assist health professionals in the assessment of students, discarding diseases. What worries us is that the focus is on the student, as responsible for his/her difficulties and the lack of information in the medical records relieves the school from its responsibility on educating students what is against the World Declaration of Human Rights (UNESCO, 1998a), the Convention on the Rights of child (Brazil, 1990), the World Declaration on Education for All (UNESCO, 1998b) and the ECA (Brazil, 2009).

It seems is that the school, when meeting a student who “does not fit” to its “model” sees in health something that can solve its problems, as argued Landskron and Sperb (2008), Nakamura et al. (2008) and Meira (2012).

We need to think on the growth of the pharmaceutical industry in an increasingly growing market, and Guarido and Voltolini (2009) denounce the marketing done by them in a capitalistic society which aims at quick wins, leaving aside the human experiences as something unwanted, pathologizing and applying drugs emotions, subjectivity, diversity and measuring the student failure of a losing educational system, where “drugs entry occurs right there in the place before occupied by the teacher, or the teacher is not the drugs anymore (...)” (p. 257).

Overburdened teachers? Highly-numbered classes? Too-fulfilled with contents to be taught? External examinations requirements (Prova Brasil, SARESP, etc.)<sup>2</sup>? Low wages? Deficient training? Lack of incentives—internal and external to the school environment? Whatever be the reasons on which are based educators, the fact is that increasingly we have less and less time to listen to our students, know them beyond the academic contents in a traditional school, still concerned with subjects. No doubt this helps us to understand our students less and simply classify them “fit for our school” or “not fit for our school”. The educational system demands thoughts in its structure, as well as schools for diverse teaching practices. Valuing diversity, seeking teaching strategies that cover diversity—these are school needs for everyone.

## 5. Conclusions

We found in this case study that were referred to health services two students with different background complaints, the first on learning and the second, on behavior. Thus, what seems is not to exist a “profile” specific complaint that is “appropriate” to this referral. It seems that if the student does not have an appropriate profile to the school he must be referring to health services as an option of “adequacy” of “adjustment”.

We have thought all the text long that the school is covered by diversity, based on laws that indicate an enriched service that takes into account time and students learning style, however this did not unfortunately mean the teaching action.

We are immersed in paradoxes—society and school change in completely different periods and the student needs, as one who has a key in his/her cognitive and behavioral system, change it according to the environment he/she is in, sometimes schooling, sometimes social, looking for all the time to adapt to these systems, as a penalty to be segregated. In Brazil, the health system is completely devoided from the educational system, and this generates conflicts and differences, because each one has some observation lens on that student.

One possible way to such paradoxes would be collaborative teamwork (Capellini, Zanatta, & Pereira, 2008; Capellini, 2010; Zanata & Capellini, 2013)—the collective discussion of such cases within the school, even in

<sup>2</sup>**Prova Brasil:** national survey used to calculate the Idesp (Development Index of the São Paulo State Education). **SARESP:** test applied annually by the Department of Education of São Paulo (ESS/SP) to assess the basic education of the state system.

the early, lasses of elementary school; we must think on homogenizing practices and seek for educational alternatives for different students present in the school context.

Therefore, it is necessary to develop a culture that values diversity; the record in medical records is relevant, it is necessary to work out information about the teaching strategies used with the student, providing the health team with data not only focused on the student, but in the context in which he is inserted, in this case, the school community. One must consider the student's records as relevant—that needs to be constantly updated, approaching the school system of the health system, but not only in the form of immediate referral, but also as a form of consultation, observation, and consulting. Moreover, the health area should be aware that the school is surrounded by a social, political and cultural context, being the organic aspects only one of the dimensions involved.

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# Interprofessional Education as a Need: The Perception of Medical, Nursing Students and Graduates of Medical College at King Abdulaziz University

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## Abstract

Interprofessional education (IPE) is when members or students of two or more professions learn from and about each other to improve collaboration and quality of care. The aim of this study was to identify the awareness and importance of IPE among medical and nursing students and graduates at King Abdulaziz University. A cross-sectional study was conducted with fourth-year medical students, fourth-year nursing students, interns, and internal medical residents at King Abdulaziz University and hospital. A survey was completed by all the participants after they gave their consent. Participants were asked whether they knew the meaning of IPE. We explained IPE to those who did not know what it was. Then, each participant was asked to rate all 11 items on the survey with one of five choices: strongly agree, agree, undecided, disagree and strongly disagree. A total of 105 professionals participated in the study. The participants were primarily fourth-year medical and nursing students, all of whom were women. However, for the medical interns and medical residents, we included both men and women. Only 12 (11.4%) participants knew the meaning of IPE, all of whom were medical residents. The majority—77 of 103 (75%), most of whom were nursing students—responded that IPE is important. The difference between the groups was also significant ( $P = 0.008$ ). In conclusion: Our study showed that our medical students and graduates valued IPE and thought that the implementation of IPE in their education would improve both patient care and health care provider satisfaction.

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## Keywords

Medical Students, Nursing Student, Interprofessional Education, King Abdulaziz University

## 1. Introduction

Interprofessional education (IPE) is defined by the UK Centre for the Advancement of Interprofessional Education (CAIPE) as the occasion when members or students of two or more professions learn from and about each other to improve collaboration and quality of care (Blue et al., 2010; Buring et al., 2009; Hammick et al., 2007; Levisohn, 2003; Oandasan et al., 2005; Olenick et al., 2010). IPE is also defined as a teaching and learning process that fosters collaborative work and improves quality of care between two or more professions. The Canadian Interprofessional Health Collaborative (CIHC) adds that IPE occurs when health care professions learn collaboratively within and across disciplines to acquire knowledge, skills and values for working in teams (Canadian Interprofessional Health Collaborative (CIHC), 2014). IPE is different from multi-professional education or shared and common learning (An RCN Literature Review, 2007).

IPE was promoted in 1988 by the World Health Organization (WHO) through two reports on continued education for physicians learning to work together to improve health care (Barr, 2002; Hammick et al., 2007; Thistle Thwaite, 2012). The WHO has continued supporting IPE, and most recently, it published the framework for Action on Interprofessional Education & Collaborative Practice in 2010.

The importance of IPE came from the need for health care team members who provide high-quality care in the most collaborative and competent way (Hall et al., 2001; WHO, 2014). Each member of a health care team needs to understand the role of other members from different professions using appropriate communication and conflict-management skills (Hall et al., 2001; Lumague et al., 2006). Furthermore, the aging society, the increase in chronic illnesses and patients in need of complex care, and rapidly evolving scientific knowledge necessitate interprofessional collaborations for optimal patient care (Lumague et al., 2006; Thistle Thwaite, 2012; WHO, 2014).

Another important driving factor for IPE is that it is an important accreditation standard or recommendation guideline for different health care professional education national and international accreditation bodies and councils (Buring et al., 2009; Julio et al., 2010; Canadian Interprofessional Health Collaborative (CIHC), 2014; Thistle Thwaite, 2012).

IPE has been shown to be effective at learner levels, patient care levels and organizational levels (Hammick, 2000; Horsburgh et al., 2001; Humphris, 2007; Remington et al., 2006).

Compared with traditional education, IPE has been found to enable the knowledge and skills necessary for collaborative teamwork (Hammick et al., 2007; Hammick, 2000).

IPE is effective in teaching students the roles of other health care professions and changing students' attitude towards them (Horsburgh et al., 2001; Humphris, 2007; Lumague et al., 2006; Mires et al., 2001; Ponzer et al., 2004; Remington et al., 2006; WHO, 2014).

IPE increases job satisfaction and decreases workplace tension and conflict (Hammick, 2000; Ponzer et al., 2004).

IPE has also been found to have a positive effect on patient care, patient and family satisfaction, patient safety and error rates (Buring et al., 2009; Hammick, 2000; Hammick, 2006; Ponzer et al., 2004; Reeves et al., 2013).

IPE is cost-effective and leads to savings by reducing the use of services, leading to less redundancy in medical testing. IPE has positively affected the appropriate use of health resources and increased the use of preventive services (Hammick, 2000; WHO, 2014).

In Saudi Arabia, the number of health care education centers and colleges is rapidly developing and increasing. Furthermore, the number of patients with chronic illnesses (like diabetes) who need health care professionals' interaction and collaboration is increasing. Additionally, several outbreaks of serious infections have been increasingly recognized during the Hajj and Omra seasons, calling for the need for efficient health care personnel interactions during patient care (Al-Nozha et al., 2004; Middle East Respiratory Syndrome Coronavirus (MERS-CoV)—Saudi Arabia, 2014).

The aim of this study was to identify the awareness and importance of IPE among fourth-year medical and nursing students and medical interns and residents at King Abdulaziz University's medical and nursing colleges and King Abdulaziz University Hospital.

## 2. Methods

This was a cross sectional study.

This work was carried out as an activity with the Master's of Medical Education program (a collaborative program between UIC and KAU) that has the approval of the medical faculty and King Abdulaziz University. The fourth year of the medical program is the first clinical year; the students practice on real patients in a hospital context. In the school of nursing, the fourth year is the final year of the program, and students are taught both in the hospital and on campus. The medical interns are graduates of the school of medicine (both males and females) who have received a diploma and are rotating in their mandatory internship year in hospital-based training. Internal medicine residents (both males and females) are residents in the 4-year Saudi internal medicine training program.

Study population: Fourth-year medical students (all females), fourth-year nursing students (all females), interns completing an internal medicine rotation, and internal medical residents at King Abdulaziz University and King Abdulaziz University Hospital, Jeddah.

Data were collected by two research team members, one intern and one resident. The meanings and spectrum of IPE were explained thoroughly to the participants. Then, a survey in the form of a questionnaire was completed by all of the participants after they had consented to participating. The survey was conducted as follows. Each candidate was asked if he/she knew the meaning of IPE; if he/she did not, we explained it. Then, each candidate was asked to rate all 12 items on the survey with one of five possibilities: strongly agree, agree, undecided or not sure, disagree or strongly disagree. The items were as follows:

- 1) Learning with other health care students will make me a more effective member of health care and social teams.
- 2) Patients will ultimately benefit in health and social care if students learn together.
- 3) Communication skills should be taught and learned with other health care students.
- 4) Teamwork skills are vital for all health care students.
- 5) Learning clinical skills together before qualification will improve the work environment.
- 6) Some of the communication skills that are related to patients' safety should be taught to medical and nursing students together.
- 7) Respecting other health care students is essential for IPE to be effective.
- 8) IPE for medical and nursing students is a waste of time.
- 9) It is not necessary for medical and nursing student to learn together.
- 10) I would welcome the opportunity to learn clinical skills with other health care students.
- 11) IPE before qualification will help me to be a better team worker.

The last Item was: "If you think IPE is important, what level of medical and nursing education is the appropriate time to apply it?" For this item, medical students, nursing students and interns were given 5 options: pre-clinical years, clinical years, at both preclinical and clinical years, internship, and the time is not important. Internal medicine residents were given all 5 options and an additional option about IPE during residency.

The survey was completed and collected over 2 days, February 11-12, 2014.

## 3. Results

A total of 107 participants agreed to complete the questionnaire. Two candidates—one resident and one fourth-year medical student—turned in an incomplete form with missing items; they were excluded from the analysis. The remaining 105 participants were primarily fourth-year medical and nursing students, as shown in [Table 1](#). We included only female medical students to be comparable to the nursing students, who were all females; however, for the medical interns and medical residents, we included both males and females (50% each). Only 12 (11.4%) candidates knew the meaning of IPE, all of whom were medical residents; the remaining 93 (88.6%) subjects had no idea what IPE was. The majority—77 of 103 (75%)—responded that IPE is important for the health care profession during their education as shown in [Table 2](#). All 40 nursing students (100%) either strongly agreed or agreed that IPE is important, whereas 16 (64%) medical students, 13 (68.4%) interns and 8 (38%) residents either strongly agreed or agreed that IPE is important [Table 2](#) and [Figure 1](#). The difference between the participants of the three medical levels and the nursing students was significant according to the chi-squared test ( $P = 0.001$ ), and the difference between all the groups was also significant ( $P = 0.008$ ). This finding was also supported by the responses to the item regarding whether IPE was a waste of the participants'

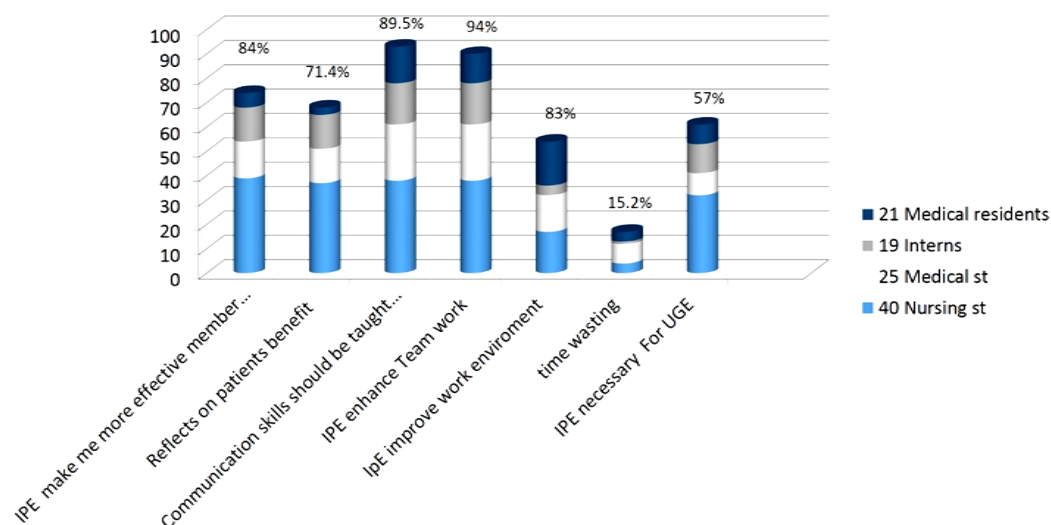
**Table 1.** Number and percentage of participants according to academic level.

Category of participants	Number	Percent
Residents	21	20.0
Interns	19	18.1
Nursing students	40	38.1
Medical students	25	23.8
Total	105	100.0

**Table 2.** Participants' responses to the first 11 items of the survey.

	Strongly agree	Agree	Not sure	Disagree	Strongly disagree
1) Learning with other health care student will make me a more effective member of health care and social teams.	41 (39%)	47 (44.8%)	9 (8.6%)	6 (5.7%)	2 (1.9%)
2) Patients will ultimately benefit in health and social care if students learn together.	26 (24.8%)	49 (46.7%)	21 (20%)	8 (7.6)	1 (1%)
3) Communication skills should be taught and learned with other health care students.	48 (45.7%)	46 (43.8%)	6 (5.7%)	5 (4.8%)	0
4) Teamwork skills are vital for all health care students.	54 (51.4%)	44 (41.9%)	5 (4.8%)	2 (1.9%)	0
5) Learning clinical skills together before qualification will improve the work environment.	36 (34.3%)	51 (48.8%)	8 (7.6%)	10 (9.5%)	0
6) Some of the communication skills that are related to patients' safety should be taught to medical and nursing students together.	34 (32.4%)	49 (46.7%)	14 (13.3%)	7 (6.7%)	1 (1%)
*7) Respect and trust are essential for IPE to be effective. 103 respondents	59 (56.2%)	42 (40%)	1 (1%)	1 (1%)	0
8) IPE for medical and nursing students is a waste of time.	4 (3.8%)	12 (11.4%)	25 (23.8%)	46 (43.8%)	18 (17.1%)
9) It is not necessary for medical and nursing students to learn together.	5 (4.8%)	17 (16.2%)	23 (21.9%)	47 (44.7%)	13 (12.4%)
**10) I would welcome the opportunity to learn clinical skills with other health care students. 103 respondents	28 (26.7%)	49 (46.7%)	10 (9.5%)	15 (14.3%)	1 (1%)
***11) IPE before qualification will help me to be a better team worker.	32 (30.5%)	56 (53.3%)	13 (2.4%)	2 (1.9%)	0

\*2 candidates did not respond to item 7; \*\*2 candidates did not respond to item 10; \*\*\*2 candidates did not respond to item 11.



**Figure 1.** Result of survey about Interprofessional education among KAU medical and nursing students and medical graduates.

time; only 12 (18.5%) of all medical participants and 4 (10%) of nursing participants strongly agreed or agreed that IPE was a waste of their time.

There was a difference between the different groups of participant with respect to the suggested levels of implementation: 18 (45%) nursing students thought that the IPE is best during the internship for both medical and nursing students, whereas 9 (36%) of medical students thought that IPE is best during the clinical years of education ( $P = 0.014$ ) between all the groups.

#### 4. Discussion

Our study showed two main findings. The first finding is that the majority of our medical and nursing graduates do not understand what IPE is; this by itself is important because the interaction between the medical and nursing student starts in the obligatory internship year, immediately after graduation. During the internship year, there is actual interaction with other health care providers. This finding is important because IPE is an internationally recognized term and is implemented by various accreditation bodies as a standard for the accreditation of health science colleges (Blue et al., 2010; Buring et al., 2009; Hammick et al., 2007; Levisohn, 2003; Oandasan et al., 2005; Olenick et al., 2010). However, we did not come across any paper that addressed IPE among health care students from Saudi Arabia or from the gulf region. The second important finding from our study is that, after explaining to the participants the meaning of IPE, most of the participants highly valued IPE and agreed to have IPE classes that include medical and nursing student during their college education. This is, again, important because King Abdulaziz University is a leading university in Saudi Arabia that helps establish multiple health care colleges in other national universities. Along with other national and regional health care colleges, King Abdulaziz University may need to consider developing IPE programs in their current updated curricula. Students' perception of the effectiveness of IPE in improving teamwork abilities and communication skills has been shown previously in several studies from several countries (Hall et al., 2001; Hammick, 2006; WHO, 2012). Furthermore, and similar to our student expectations, IPE has been shown to have a positive effect on patient care and outcomes and to influence the satisfaction of both patients and their families (Buring et al., 2009; Hammick, 2006; Hammick, 2000; Ponzer et al., 2004; Reeves et al., 2013). The positive expectations of our students support the need for IPE in our health care colleges, particularly medical and nursing colleges, and particularly because the graduates of those two colleges interact most of the time in real patient care practice. We found that all of the nursing students were more supportive of IPE, but among medical students, there was a difference according to academic level; this difference between students may reflect their level of knowledge and differences in the curriculum load between the medical and nursing college students. Another reason might be due to the elevated social and cultural recognition of doctors' professional identity over that of nurses', which has been shown by previous studies (Barker et al., 2005; Mandy et al., 2004). It is notable that only a few stu-

dents thought that IPE would be a waste of their time, even among medical students, who have a busy curriculum. Participants in our cohort suggested different levels for the implementation of IPE, but most of them agreed that IPE during the clinical years of education is essential. Previous reports have suggested that the appropriate timing for implementation is essential for the effectiveness of IPE (Bridges et al., 2011; Hojat et al., 2001; Sweet et al., 1995). As a new program, the implementation of IPE in an institution will require preparation and arrangements between the administrations of both the medical and the nursing colleges, curriculum program developers from both colleges and full institutional support. A pilot implementation will help to determine the weaknesses in the program prior to full implementation (Barr, 2002; Blue et al., 2010; Buring et al., 2009; Hall et al., 2001; Hammick et al., 2007; Humphris, 2007; Levisohn, 2003; Olenick et al., 2010).

## 5. Limitations of the Study

1) Most of the participants were of 4<sup>th</sup> year medical and dental students and other levels of students like 5<sup>th</sup> and 6<sup>th</sup> year medical students were not included, that group might have different perception because of busier curriculum compared to 4<sup>th</sup> year students.

2) Similarly nursing interns and graduated practicing nurses were not included and again they might have different perception about IPE.

## 6. Conclusion

Our study showed that our medical student and graduates valued IPE and thought that the implementation of IPE in their education would improve both patient care and health care providers' satisfaction. These findings and the current burden of chronic and seasonal diseases call for the real consideration of IPE among national health care colleges.

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# Vocational Counselling and Transition Skill Training for Adolescents with Special Needs

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## Abstract

Adolescence is a period of transition from childhood to adulthood which implies many developmental changes and challenges. One of the most critical turning points in the lives of adolescents is the transition from schools to the world of post-secondary education, employment, and life in the general community as an adult. Developing independence, examining one's talents and interests, deciding upon a career path and pursuing either employment or additional schooling are just some of the challenges that youth in transition face. Moreover, the children with specific disability and special needs are faced with some serious challenges like un-employability, social maladjustment, and emotional disturbance etc. as the period of transition approaches. These adolescents are unemployed at a higher rate than their general peers, tend to drop out of school halfway, and are more likely to get involved with criminal activities. Thus, the education and rehabilitation of these young children with special needs has really become a challenging field in recent time. Counseling and informal education generally would enable these exceptional children to overcome their disability to a large extent and make them effective individuals in the society. The present paper highlights some of these crucial issues.

## Keywords

Vocational Counselling, Transition Skill Training, Adolescents with Special Needs, Rehabilitation

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## 1. Introduction

Any period of change is likely to be accompanied by many potential difficulties. Adolescence is a period of transition from childhood to adulthood, which implies many developmental changes and challenges. Thus, the children with specific disability/special needs would certainly grow up to be adolescents and young adults with disabilities and special needs. One of the most critical turning points in the lives of young people is the transition

from schools to the world of post-secondary education, employment, and life in the general community as an adult. Developing independence, examining one's talents and interests, deciding upon a career path, and pursuing either employment or additional schooling are just some of the challenges that youth in transition face. Moreover, the studies show, the students with special needs are faced with serious challenges like un-employability, social maladjustment, emotional disturbances etc. as the period of transition approaches (Kransntover, Thurlow, & Bruininks, 1989; National Transition Longitudinal Study, 1994, USA). These adolescents are unemployed at a higher rate than their non-disabled peers; they tend to drop out of school half the way; they are more likely to get involved with the criminal system to a great extent and tend to be living in a dependent situation for a longer period of time (Edgar, 1988). Thus, the education and rehabilitation of exceptional children is really a challenging field. In India, according to a report of the National Sample Survey Organization - 2002, the number of handicapped persons (in India) is 1.85 Crore and they formed 1.8% of the total estimated population. About 10.63% of the handicapped persons are suffering from more than one type of disability. Approximately, India has 30 million children with different disabilities. At present only 1% to 2% of them are in schools. In contrast to this picture, Article 45 of the Indian Constitution directs that free and compulsory education should be provided to all children, which implicitly cover those who are handicapped/disabled. Counselling and education generally enable an exceptional child to overcome largely his exceptionality and make him an effective and useful individual. Social justice also demands it. Thus, the primary objective of this paper is to provide and suggest some information and strategies for helping adolescents and young children with special needs to make a successful transition from school to the adult-community.

Every year thousands of students with special needs exit high school and face the demands of independent living settings, post-secondary education programmes and, ultimately unemployment. World Health Organization (WHO) in one of its report stressed the fact that individual development and social contribution of adolescents will shape the future of the world and therefore, investment in children's health, nutrition and education is the foundation for national development. In view of this, providing for education and training of an enormous number of adolescents with special needs is an immense undertaking. The primary task in this context is to prepare these children not only to become independent and earn their livelihood but also for adjustment to their socio-cultural environment.

The transition literature suggests that students with special needs require self-advocacy training, employability skills training, systematic referral to adult agencies, life skills education, family involvement, and immediate and ongoing job support in order to obtain and maintain employment over time (Clark, 1994; Wehman, 1993; WHO, 1997). Hence, comprehensive transition skills, employability skills and related social skills must be taught during the high school years to assure student success in the adult world. During the elementary and middle school years, special education services tend to emphasize academic skills. As students with disabilities enter adolescence and young adulthood, a greater emphasis is placed on vocational and general life skills. This is commonly referred to as career education.

Career education includes more than just vocational training/counselling and job placement. This refers to the total process of preparing exceptional individuals for the many roles of adulthood. Career education prepares individuals with disabilities for the several life roles which make up an individual's career. These life roles may include an economic role, a community role, a home role, and an aesthetic role. The transition skill training/services refer to even more comprehensive and coordinated set of activities than just career education or vocational counselling. Transition services are designed within an outcome-oriented process, which promote movement from school to post-school activities, including post-secondary education, vocational training, integrated employment, continuing and adult education, adult services, independent living, life skills training, community participation etc. These set of activities should be based upon the individual student's needs, taking into account his/her preferences, interests and would include instruction, counselling, community experience, the development of employment and other post school/adult living objectives and acquisition of daily living skills and functional vocational evaluation. In recent times several world organizations i.e., WHO (1997), UNESCO (2001) have also stressed on life skills training for adolescents for the acquisition of abilities for adaptive and positive behavior that enable the teenagers to deal effectively with the demands and challenges of everyday life.

## 2. E Components of Transitional Skill Training: Vocational Skills

### 2.1. Job Search Skills

FA critical element in any transition program for high school students with special needs is a job-search curri-

culum. Adolescents with disabilities need instruction in skills like conducting a personal job search, filling out job applications correctly and preparing a resume (Patton, 1991), as well as alternatives such as school-based vocational development and placement. The vocational counsellors whenever organizing some transition programmes should infuse some of these guidelines i.e.,

- 1) Include at least 2 to 3 weeks of skill building in how to search for job opportunities;
- 2) Include instruction in developing a resume;
- 3) Include instruction in filling out job applications neatly, accurately and completely;
- 4) Include instruction in how to give interview for a job, the critical communication skills required for a success full job interview;
- 5) Include instruction on what essential documents are needed for getting a job etc.

## 2.2. Job Maintenance Skills

Job success depends more on effective job maintenance skills such as communication and interpersonal skills and good work habits than upon actual job skills. Employers consider worker behaviors and attitudes to be important for job performance. In a study when employers were asked to rank factors judged to be critical to job success for workers with disabilities, the five highest ranking factors were: 1) getting along well with others; 2) interest in the job; 3) efficiency; 4) dependability; and 5) being able to adapt to new work situations (Chamberlain, 1988). Students with special needs can be jeopardized by their “hidden” disability, which manifests itself in the work-place as inappropriate socialization, lack of initiative, poor attitude, defiance, and other behaviors which cause loss of jobs early on. Hence, adolescents with disabilities require systematic instruction in order to learn and practice the critical skills of keeping a job. They also need on-the-job support to ensure that appropriate job maintenance skills have been generalized in the workplace over time. The high school curriculum and transition programme must incorporate some of these guidelines/principles such as:

- 1) Include at least a semester-long course in job maintenance skills emphasizing a job-keeping behaviors and job related social behaviors;
- 2) Include opportunities for part-time jobs while enrolled in a job maintenance skills course;
- 3) Providing ongoing and frequent support to working students, the strategies may include teaching skills on the job, employer communication etc.

## 2.3. Job-Related Functional Academics

Reading and writing on the job, figuring computations, estimating, making change, and using time wisely are functional academic skills that can be taught in the classroom to help students succeed on the job. Students with special needs are unable to generalize transitional academics to the real world of employment and adult living. Job related functional academics such as counting change, operating cash registers, and calculating net and gross pay are easily infused in to the regular math course.

## 2.4. Mobility and Transportation Skills

The need for mobility skills has long been recognized by educators of individuals with severe disabilities (Laus, 1977), but overlooked by educators of students with mild disabilities. Students cannot be successful on the job if they cannot get to and from their jobs. A majority of students with mild disabilities depend on public transit for transportation. As the urban transit systems are extremely complex students with special needs have difficulty in understanding the bus routes, transfer points and directions etc. In addition they are generally naive about safety practices and appropriate social interactions when using public transit. Hence, the school curriculum at secondary level should include opportunities for students to learn, practice and generalize the skills of:

- 1) applying for bus passes; 2) reading and interpreting bus route information; 3) using public transit safety including road safety and emergency strategies; 4) using actual routes from home and school to places of work; and 5) travelling independently from home to school to a work site.

## 3. Counselling for Post-Secondary/Vocational Education

Transition programmes should include structured planning for recreation activities and community collaboration which can guide the youths towards healthy recreational pursuits. School counsellors should take a more active

role in career planning for students with disabilities and initiate early career planning with parents and students. Students need to become aware of the many programs that can help them beyond high school, including community college programs, disabled student services, occupational preparation programs, vocational training programs, and adult agency services. It is found from the study that students before high school completion are more likely to stay in school, remain employed after school completion, seek post-secondary education opportunities, and become self-supporting adults (Edgar, 1987). Hence, school counsellors should become an integral part of the transition team, so they are informed and knowledgeable about the multitude of post-school program options for these students. High school special education teachers, job coaches and other special education support personnel can play a vital role in the transition programme for successful living.

#### 4. Training of Self-Advocacy Skills

Self-advocacy, or speaking for oneself, is a big part of living in the community. The ability to advocate for oneself on the job and in the community is essential. Young adults with disabilities who live in the community should have the right to make their own decisions, just like anyone else. Hence, during high school, students need to learn how to advocate for themselves and how to be proactive participants in their transition planning process. Transition planning models also stress that parent involvement should be an integral part of transition planning for youth with special needs. Michaels (1989) claims that specific job maintenance skills must be taught to lead to self advocacy. He recommends curriculum including the information on:

- Accepting criticism, changing behavior to reflect input;
- Dealing with supervisors/managers, including discussing the disability and requesting appropriate accommodations;
- Self evaluation of performance, monitoring task completion, and providing self-feedback;
- Goal-setting, including developing short and long-term goals, and monitoring progress;
- Developing a vocational plan that includes goals for career advancement, job upgrading, and how to protect one's interest; and
- Developing social skills and appropriate behavior/interactions for the job setting.

Schools should also set target goals for parent participation in transition planning and frequently monitor the extent and quality of parent participation (Cobb & Brody-Hasazi, 1987). Parent involvement should also be an integral part of transition planning for youth with special needs. Family members need to be taught the effective strategies for supporting the efforts of a working student, strategies for accessing adult community services, and other information specific to their youth's transition from school to the adult community. The parental training activities should include certain activities i.e., providing incentives for parents' participation, someone should be given the responsibility as family coordinator specialist (in the transition team) who should make as many home visits as possible. For the purpose of informing family members about the transition programs as well as about the adult living and employment goals for the students the coordinators are supposed to handle the family involvement in a very sensitive and appreciative manner. Adolescents/adults with developmental disabilities can and should have an impact on services by participating in agency boards and training activities. They have the right to learn to speak for themselves. It's important because there will be a day when our parents won't be able to speak for us. Hence, disabled children can be trained to teach each other how to speak for themselves. Role—playing a variety of problems or situations is a good way to learn self-advocacy. There is more strength in forming a group. People speaking through a common platform can have a better chance/scope of catching attention and listening to their problems. Clark and Kolstoe (1990) emphasize the importance of the “Individualized Transition Plan” (ITP) in increasing a student's chances for success after high school. The transition team must include the student, family members, school personnel, adult agency personnel, community liaisons, and other supporting staff. Planning for instruction and services must include the period, and the first few months of independent adult living. It should include all aspects of transition instruction and services including job search skills, job maintenance skills, transportation training, recreation activities, placement and support, paid part-time jobs during high school, early referral to adult agencies, self-advocacy skills, parent involvement, plans for high school exit, and any other instruction and services specific to the individual students' needs. Planning should include a follow-up evaluation of the delivery of transition services for all adolescents with special needs.

#### 5. Training of Social and Life Skills

WHO has defined life skills “as the abilities for adaptive and positive behavior that enable individuals to deal



effectively with the demands and challenges of everyday life” (WHO, 1997). Skills thus, enable us to translate knowledge, attitudes and values into actual abilities to know what to do? When to do? How to do? When faced with real life situations? Skills also enable us to behave in healthy way and think and act with logic and sensitivity skills needed are also determined by temporal and spatial considerations. The same skills may not be relevant or useful in all the occasions all the time. The same may be applicable to individuals across culture and regions (INC and UNESCO 2001). There is a core set of skills needed that are needed for the promotion of health and well being of children and adolescents, such as thinking skills, daily living skills, social skills, negotiation skills, non-judge mental skills, empathy skills etc. Self-awareness is the first life skill. The adolescents with special need can be made aware of their rights, duties and responsibilities towards themselves as well as society. They can also be trained to develop skills to think critically by providing them different opportunities to look at different perspectives of an issue the pros and cons of allowing one decision over the other and making them realize the negative consequences of making hasty and unplanned decisions. The daily living skills include managing personal finances, selecting and managing a household, caring for personal needs, raising children and meeting marriage responsibilities, buying, preparing and consuming food, clothing, using recreational facilities and engaging in leisure, getting around the community and exhibiting responsible citizenship etc. The social skills include appreciating others, working with others, understanding their roles, building positive relationships with friends, family and peers including the opposite sex, listening and communicating effectively, taking responsibility and coping with stress. Social skills enable the adolescents to be accepted in society and to accept social norms that provide foundation for adult social behavior. Many adolescents with special needs have very little idea how to interact appropriately with their classmates. They simply lack the social skills needed to perform the most basic cooperative tasks. Lack of social skills is probably the biggest factor contributing to lack of academic success in teams. Fortunate social skills can be taught just like academic skills. Negotiation skills do not only refer to negotiating with others but with one’s own self as well. For effectively negotiating with others, one needs to know what he wants in life, is firm as one’s values and beliefs and can therefore say “no” to harmful behavior and risky situations. To avoid drug abuse negative peer pressure and other risky situations, adolescents need to develop negotiating skills. Non-judge mental skills are mainly needed by teachers or parents. For taking their own decisions, adolescents should be presented with pros and cons of a particular situation without elders imposing their own values on children. This will enable adolescents to take their own decisions independently. Teacher and parents should not be prescriptive as preaching may prove to be counterproductive. Empathy skill is the ability to imagine what life is like for another person, even in situation that we may not be familiar with. Empathy can help us understand how the other person feels in a particular situation and what his/her point of view is? Cultivating empathy for different groups in society can help reduce incidence of violence and abuse in the society. All the above mentioned skills are interlinked with one another (Seth, 2000). For example, the decision-making skill is likely to involve creative and critical thinking and value analysis. The base of good interpersonal relationship is empathy and habit of good listening. Having learnt to cope with emotions and stress also contributes to better interpersonal relationship with others.

To effectively influence the behavior, skill building in the target group needs to be content area or topic specific. We must be clear about what are we making decisions about. Learning about decision making will be more meaningful if the content is relevant and remain valid over a period of time. Developing skills related to various issues of physical and mental health of adolescents with special needs requires the proper development of above mentioned skills. Some of the personal social skills such as achieving self-awareness, acquiring self-confidence, achieving socially responsible behavior, maintaining good interpersonal skills, achieving independence, making adequate decisions, communicating with others etc are to be developed among adolescents. Skills enable adolescents to translate knowledge, attitudes and values into actual abilities that enable adolescents to behave in healthy ways, given the desire to do and given the scope and opportunities to do so (WHO, 1997). In skill development, the emphasis is more on “What to do?”, and “How to do”. Before we can help students improve their social skills, they need to understand why these skills are important. Some students have problems in cooperative learning teams. A crucial ingredient in employment success is the development of adequate work habits and personal social skills. More specific to successful employment are the social-vocational skills of: 1) independently managing one’s activities; 2) meeting minimal cleanliness and dress requirements; 3) getting along with colleagues and supervisors; 4) following directions, taking turns, sharing materials, patient waiting etc.; 5) punctuality; 6) time management; 7) active listening; 8) resolving conflicts; 9) keeping an orderly work environment; 10) following directions, paraphrasing; 11) staying with the team and sharing ideas maintaining a



moral work ethic and friendliness on the job. The purpose of training of job-related social skills and other life skills is to teach adolescents these skills that will increase their opportunity for job success as well as social and personal adjustment in daily life. These can be taught either with a curricular or co-curricular approach following systematic instruction, repeated practice and feedback to the learner regarding the appropriateness of responses. Since social skills are generally learned through observing the actions of others, students are to be taught to refine their observation skills. They should also be taught to improve their interaction and problem-solving skills, to think before acting. Job related social skills can be developed through the training of different sections of activities like 1) instructional guide; 2) job skills training format; 3) self-management strategies; 4) job-related social skills evaluation; 5) monitoring students on the job; 6) appendices etc. The job-related social skills can be listed as: 1) ordering job responsibilities; 2) understanding instructions; 3) making introductions; 4) asking questions; 5) asking permission; 6) asking for help; 7) accepting help; 8) offering help; 9) requesting information; 10) taking messages; 11) having a conversation; 12) giving directions; 13) receiving compliments; 14) and giving compliments etc. Being a counselor or teacher we can prepare an Individualized Transition Plan taking into accounts all the above skills and organize the transition skill training programme for the adolescents with special needs. Such type of pilot projects have already been initiated by [NCERT \(2002\)](#), UNFPA, (i.e., [National Population Education Project, 2002](#)) to test the effectiveness of different strategies of skill training among adolescents and youths.

## 6. Conclusions

However, in order to make such (and many others) programmes more effective, efforts should be made to sustain them over a larger period of time as skill building occurs after repeated practice. Network of skill building activities should be extended to the community/out-of-school youth and children with differential needs, so that students would be able to find favorable environment both in the school and out-of-school in the community, which act for them as a laboratory of real life situation and also help the adolescents with special needs.

In USA Vocational Rehabilitation is a federal program whose purpose is to empower individuals with disabilities to achieve gainful employment consistent with their strengths, resources, priorities, concerns, abilities, and capabilities, so that they can prepare for and engage in gainful employment. The disabled people should be empowered to maximize their economic self-sufficiency, independence, and inclusion/integration into society through comprehensive vocational training programmes. In fact, these individuals should be active participants in their own rehabilitation program and can make meaningful and informed choices in selecting personal vocational goals and vocational Rehabilitation services.

Moreover, support for family involvement as well as systematic advocacy and community involvements are also being facilitated. The Vocational Rehabilitation agencies usually take the charge of these services, by following the guidelines of the governments. Another initiative taken by the US federal government is the STWO Act ([School-to-Work Opportunities Act, 1994](#)) which ensures a national framework for the development of School-to-work opportunities for every state and provides funding to enhance the opportunities for youth to gain technical skills and education that would assist them in transition from school to work. In fact STWO Act strives to build the partnership among the public school system and private business intended to increase the relevance of school-related activities to the requirements of the workplace.

In this context some authors have suggested for a new paradigm of integrating vocational psychology and counselling psychology. Thus, vocational issues are viewed as primary issues and contextual factors in people's lives. The vocational factors will provide another facet to understanding the multiple life roles and complex contexts in which we live ([Robitschekz & De-bell, 2002](#)). This new paradigm conceptualizes vocational issues as an integral part of theory, research and practice, and counseling psychology. Hence, vocational issues should be an integrated part of counselling psychologists' practices.

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# The Construction of Scientific Knowledge at an Early Age: Two Crucial Factors

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## Abstract

This article presents and justifies a proposal for the priority of two activities in the early childhood curriculum, namely, those of “storytelling” and the “movement of objects”. Given, on the one hand, the growing interest in science activities for very young children, and the notion of “developmental appropriateness” on the other, the concern about early experiences in physical science is both pressing and legitimate. In the light of such concern, the idea that children should simply participate in interesting activities or in activities that in general enrich their experiential background, needs to be reconsidered. Given that the construction of scientific knowledge involves the construction of relationships among concepts and ideas, and presupposes curiosity and affective imagination, science stories with a science content that captures the imagination of the child, and activities involving the movement of objects appear to be more pedagogically appropriate than other activities. Therefore they should be given priority in the curriculum.

## Keywords

Scientific Knowledge, Young Children, Early Childhood Education, Logico-Mathematical Thinking, Narrative Thinking, Movement of Objects, Imagination, Storytelling, Science Stories

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## 1. Introduction

Over the last two decades there has been a growing interest in early childhood science education (e.g., Chaille & Britain, 2003; Eshach & Fried, 2005; Fleeer, 2009; Fleeer & Pramling, 2014; Gerde, Schachter, & Wasik, 2013; Trundle & Sackes, 2015). The reason behind this interest is that early experiences in the sciences can help develop in young children attitudes toward science and learning. On the other hand, such experiences help children develop science process skills, which, in turn, contribute to children’s cognitive and conceptual development

(Hadzigeorgiou, 2001, 2002; Trundle & Sackes, 2015), and hence to better understanding of science in the later years of schooling (Eschach & Fried, 2005).

It is worth noting that early experiences can provide stimulation and therefore “windows of opportunity” to children during their critical period of development. There is evidence that environmental effects on intellectual development are more pronounced during children’s first years in life (Sternberg & Berg, 1993; see also Hadzigeorgiou, 2002, 2015), and that a cognitive ability or skill may not develop in its full potential (or not develop at all) due to either the lack or the nature of provided stimuli (Bornstein, 1989; Epstein, 1978; Gardner, 1985).

However, a question is raised about the kind of experiences that young children will engage in. The message that a science educator had sent to the educational community is a case in point: “determining what is appropriate physics for first graders is not trivial” (Hammer, 1999: p. 799). Indeed, given the growing interest in science activities for young children, even those in preschool education (e.g., Chaille & Britain, 2003; Fleer, 2009, 2013; Hong & Diamond, 2012; Kamii & DeVries, 1993; Kokoski & Downing-Leffler, 1995; Landry & Foreman, 1999; Leuchter, Saalbach, & Hardy, 2014; Peacock, Smith, & Kirkby, 1994; Waite-Stupiansky, 1997) the concern about what constitutes an appropriate physical science activity for a young child is a realistic one and should be seriously considered.

Given that the value of a science activity in the context of preschool and early childhood education in general is to be assessed in terms of its “developmental appropriateness” (Bredekamp & Copple, 1997), that is, in terms of providing children with opportunities for both development and learning, some criteria for the selection of the science activities are imperative. In fact, the vast variety of activities that appear in international bibliography (e.g., Atkinson & Fleer, 1995; Brown, 1981; Browne, 1991; Harlan, 1988; Holt, 1993; Marxen, 1995; Peacock, Smith, & Kirkby, 1994; Richards, Collins, & Kincaid, 1987; Sprung, 1996; Taylor, 1993; Trojack, 1979) necessitate the proposal of a theoretical framework for early childhood science education.

Although the action of the child is considered the single most important factor in the learning process (e.g., Maxwell, 1995; Landry & Foreman, 1999; Nutbrown, 1994; Waite-Stupiansky, 1997) certain ideas need to be reconsidered. For although children can make empirical generalizations through their own actions, it is debatable whether these actions are followed by understanding. For example, children can describe that a magnet attracts certain objects, that water freezes and ice melts, and that their hands get warm if rubbed together. These are descriptions, however, which do not imply necessarily an understanding (Kamii & DeVries, 1993; Hadzigeorgiou, 2015). Unless children can put their ideas into relationship, all those descriptions will be isolated information. By the same token, children can perform an activity that is quite attractive and feel the same wonder and amazement that they feel when in a circus. Certainly, these empirical generalizations will not be forgotten, since they are the result of children’s own actions. However, the important question to be asked is this: do these activities provide children with opportunities for development?

Given that the notion of relationship is central in all perspectives on intellectual development (Sternberg & Berg, 1993), children should be given opportunities for the construction of relationships. It is these relationships that will form the foundation upon which the development of scientific concepts will take place at a later stage. Although the process of concept development is not fully understood, the view that this process involves the construction of relationships is shared among cognitive scientists, philosophers and science educators (e.g., Ausubel, Novak, & Hanesian, 1978; Basseches, 1980; Bruner, 1963; Case, 1985; Duschl, 1990; Entwistle, 1987; Hadzigeorgiou, 1997; Hirst, 1974; Novak & Gowin, 1984; Prawat, 1989; Reif & Larkin, 1991; Resnick, 1983; Scheffler, 1991). Vygotsky (1986), in fact, had made this point quite explicit: “...the very notion of a scientific concept implies a certain position in relation to other concepts, i.e., a place within a system of concepts” (p. 93). However, children should be also given opportunities to develop their imagination, since the role of the latter in the development of scientific knowledge is well recognized (Shepard, 1988; Taylor, 1967). The curriculum framework therefore for an early childhood science education could be based upon the following ideas:

- There are two different but complementary modes of thinking: the paradigmatic and the narrative (Bruner, 1986).
- The paradigmatic mode involves logico-mathematical thinking and is identified with such processes as generation and testing of hypotheses, and construction of relationships resulting from the connection and comparison of objects and situations (Copple, Sigel, & Saunders, 1984; Kamii & DeVries, 1993; Piaget, 1976, 1977).
- The narrative mode involves divergent thinking and is identified with story-telling (Bruner, 1986; Egan,

2005; Martin & Brouwer, 1991).

- The reliance on the paradigmatic mode, that is on logico-mathematical thinking (e.g., Copple, Siegel & Saunders, 1984; Kamii & DeVries, 1993), is not only inadequate but also inappropriate in the context of early childhood education (Egan, 1997, 1999a).
- The narrative mode provides opportunities for capturing children's affective imagination (see Fleeer, 2013; Hadzigeorgiou, 2001), which is an indispensable element in the process of concept development (Hadzigeorgiou, 2014; Shepard, 1988; Stinner, 1995; Stinner & Williams, 1993).
- In the case of young children the use of the narrative mode leads to conceptual development and the construction of meaning through a mediation process between two binary opposite concepts that form the structure of the plot (Egan, 1988, 1999b, 2005).

The question, of course, is which activities are more appropriate for very young children, taking into account the two modes of cognitive functioning. The discussion that follows is an attempt to answer this question, and, at the same time, justify their priority in the curriculum. The discussion focuses on two curricular activities/approaches to teaching science to very young children (i.e., ages 4 - 8): 1) the movement of objects (targeting the development of the paradigmatic mode of thought) and 2) story-telling (targeting the development of the narrative mode).

## 2. The Role of the Movement of the Objects

Although there is some overlapping among all science activities, a distinction should be made between science activities that contribute to children's cognitive development and activities that enrich children's experiential background (Hadzigeorgiou, 1998, 2015). Certainly a rich experiential repertoire is not only important but also necessary in the process of concept development. Prior experiences, according to Howe (1996), give children the possibility to go from the abstract concepts that they will be learning later in school to their concrete experiences and vice versa. Movement, as she points out, is necessary in both directions. However, it is one thing for a child to have the experience, and know (but not understand) that magnets attract certain objects, that the beam of a flashlight is straight or that water can be better absorbed by certain materials, and another thing to be able to get feedback from the reaction to his or her own action, and be able to organize those reactions in schemata and sub-schemata. It is this organization and reorganization that helps children construct relationships among a number of factors and therefore understand what is going on in certain situations. A child, for example, playing with objects of various sizes will construct a relationship between size and weight. However, the child will probably construct a relationship between weight and type of material provided that he or she has the opportunity to lift objects consisting of different kinds of material. A child also, trying to make a ball bounce as high as possible, will construct relationships among the force he or she is applying, the direction of the force, and probably the kind of the material of the ball.

Given the limitations of children's cognitive abilities (e.g., egocentrism, animism, transductive thinking) (Ginsburg & Oppen, 1969) as well as the findings of research on children's ideas (Driver, Guesne, & Tiberghien, 1985; Gilbert, Osborne, & Fensham, 1982; Trundle & Sackes, 2015), it would be unrealistic to expect young children to understand physical phenomena. Kamii and DeVries (1993), in fact, are critical of the idea that science education activities should aim at helping children understand apparently simple everyday phenomena (e.g., the formation of rain, electricity). These phenomena are too ambitious, particularly for preschool children.

So which activities are more appropriate for young children? Kamii and DeVries (1977, 1993), in answering this question, have made an important contribution to our understanding of the various science activities and their effect on children's development. Following the parallelism "between the progress made in the logical and rational organization of knowledge and the corresponding formative psychological processes" (Piaget, 1970: p. 13), Kamii and DeVries (1993) consider the history of science the best guide as to what is more appropriate for preschool children.

In primitive times, people were interested in cooking, plants, animals, and art. Just as these people structured their observations, young children learn about the properties of objects and living organisms and their interactions by acting on them and observing the regularity of their reaction. (Kamii & DeVries, 1993: p. 11)

In selecting therefore activities one should consider the activities of primitive people. The action on the part of the child appears to be the starting point in the selection process. Depending upon the relative importance of



“action” and “observation”, [Kamii and DeVries \(1977\)](#) distinguished between two broad categories of activities. The first category consists of activities in which the action on the part of the child is of primary importance, while the observation of the result of that action is of secondary importance (e.g., throwing a ball, pushing a box on the floor). The second category consists of activities in which the observation is of primary importance, while the action is of secondary importance (e.g., playing with a magnet or a mirror). Apparently, not all science activities can fall into these two categories, so [Kamii and DeVries \(1977\)](#) created another category to include other activities like dissolving different substances into the water, watching objects floating and sinking in the water and so forth. Apparently, from a constructivist point of view the best activities are those involving children’s own action.

The above categorization, however, might be a little confusing to some since action appears to be always involved and in fact be of primary importance in the case of most activities (e.g., floating and sinking, shadow playing, mixing materials). A more careful look, however, can reveal that while in some activities the reaction is due exclusively to the child’s own action (e.g., rolling a can down an incline, pulling a box, balancing a structure), in some other activities the reaction is due to the properties of the materials used and factors beyond the child’s control (e.g., mixing, cooking, ice melting, crystall making). It is probably for this reason that [Kamii and DeVries \(1993\)](#) have proposed the following three categories of activities: The first category includes activities involving the movement of objects (e.g., hitting a ball, swinging a pendulum, rolling a can) while the second category includes activities involving the change in objects (e.g., playing with water and ice, mixing different materials, growing seeds). The third category includes all the activities that fall between these two categories, (e.g., playing with the magnet, with floating and sinking objects, producing echoes). In the first category, the role of action is primary since the child has first to act in order to observe the reaction of the object. In the second category, the role of observation becomes primary and that of action secondary because “the reaction of the object is neither direct nor immediate; that is, the outcome is due not to the child’s action as such, but to the properties of the objects” ([Kamii & DeVries, 1993: p. 6](#)).

The best activities in the context of early childhood education appear to be those involving the movement of various objects ([Chaille & Britain, 1997](#); [Kamii & DeVries, 1993](#)). [Kamii and DeVries \(1993\)](#) believe that following criteria should be used for the selection of good activities:

- 1) the child must be able to produce the movement by his own action,
- 2) the child must be able to vary his action,
- 3) the reaction to this action must be observable, and
- 4) the reaction must be immediate.

[Cople, Sigel and Saunders \(1984\)](#), however, consider change an important criterion for selecting appropriate activities. The criteria they have proposed are the following:

- 1) the activity should provide opportunities for the child’s own action,
- 2) the activity should involve discrepancies,
- 3) the activity should involve transformations and rapid changes that can be observed and
- 4) the number of factors involved in the change should be small.

The ideas of transformation and contradiction are central in [Piaget’s \(1976, 1977\)](#) latest work, and apparently they have been incorporated in these criteria.

But why are activities involving the movement of objects more appropriate for very young children? For it could be certainly argued that it is quite difficult to maintain a tight division between, for example, the activity of floating and sinking and that of rolling a ball on an incline. For both activities involve action (the child places the ball on the incline but also in the water), variation of the action (the child can release the ball from different points on the incline but also release it from various heights above a sink, place it on the surface of the water or even underneath it) and immediate observation (the child observes the ball rolling but also the ball sinking or floating). Yet activities involving the movement of objects are considered more appropriate for a number of different reasons.

First, they offer opportunities for purposeful action. There is not just manipulation of an object. The child is guided by what he or she wants to achieve (e.g., hitting a box, balancing a structure, making a ball roll as far away as possible) and of course by the reactions of the object. These reactions provide feedback that allow the child to modify his or her action.

Second, activities involving the movement of objects satisfy the criterion of variation of action to a greater extent. It is this variation that enables a child to compare and contrast the objects’ reactions (e.g., the greater the



force applied on the ball the farther it moves, the higher from the ground a superball is released the higher it bounces off). These comparisons, as was previously pointed out, can help the child to organize the objects' reactions in schemata and subschemata. By contrast, any object will either float or sink, regardless of the variation of the child's action.

Third, activities involving the movement of objects offer opportunities for the construction of relationships among a number of various factors (e.g., time, distance, speed, force, type of material). A ball rolling down a ramp and hitting a box placed on the table or the floor and at the foot of the ramp, will lead the child to construct relationships between the weight of the ball and its velocity (the heavier the ball the faster it goes), between the weight of the ball and the distance the box is displaced (the heavier the ball the farther the box goes), between the height from the table or the ground the ball is released and the distance the box moves, etc. This activity, and of course many of its variations, help children construct relationships that will form the foundation for the development of the concept of mechanical energy. By contrast, in the floating and sinking activity the factors that the child can relate are only the type of objects with their behavior (e.g., wooden things float, stones or heavy things sink). In addition, as children anticipate the movement of objects, they are also coordinating spatio-temporal relationships. In other words, movement activities provide children with more opportunities for operative (logico-mathematical) thinking.

Fourth, activities involving the movement of objects offer opportunities for transformational thinking since children can watch the changes in position of the moving objects (Marxen, 1995). In the case, for example, of a ball rolling down an incline this is quite evident. In contrast, in shadow playing there is no transformational thinking (see Woodard & Davitt, 1987), despite the fact that this particular activity satisfies all four criteria given in connection with the movement of objects (e.g., the child can produce the movement of his body, can vary his or her position relative to the position of the sun or the position of the arms and legs relative to his or her body, and then watch immediately the different outlines of the shadows produced).

Apparently activities involving changes in objects do not satisfy the criteria of appropriate activities, according to Kamii and DeVries (1993) (except in the case of changing the shape of an object by applying a force). Whether a child is mixing various materials or dissolving a number of them in water, his or her action does not vary as in the case of the movement of objects. Moreover, the change that is produced is not due to the child's action but to factors inherent in the materials themselves. Even in the case of a child placing a plastic cup filled with water in the freezer, the change of water into ice is not due to the child's own action (i.e., putting the cup into the freezer), but to the chemical bonding between the water molecules.

A last word concerning the activity of "the movement of objects" should be said about the child's own body, whose movement satisfies all criteria of activities according to Kamii and DeVries (1993). In other words, the child's own body can be considered "an object", which can produce (exert), and be acted upon by, force(s). Given the evidence that sensorimotor activities can indeed facilitate the construction of knowledge in the early years (see Hadzigeorgiou, Anastasiou, Prevezanou, & Konsolas, 2009; see also Hadzigeorgiou & Savage, 2001), their priority in early education curriculum can be justified.

### 3. The Role of Narrative

It appears that the role of stories in early childhood education has to be rediscovered, since a closer and more careful look at children's mental life and capacities has shown the great importance of their orality (Bruner, 1986; Egan, 1994, 1997, 1999a, 1999b, 2005). The idea that information presented through the plot of a story is better understood and remembered than when presented in a logical or conceptual sequence is well documented (Bruner, 1986, 1992). The reason why people learn and remember more through a story is that the latter helps create in their mind a context. It is well known that context plays a major role in human understanding (Carey, 1986; Prawat, 1989). A story, as Egan (1986) argues, appears to be more appropriate than other means of communication in describing ideas about the world. According also to Martin and Brouwer (1991),

A story with just a few well chosen words, can draw in the reader or listener and create a world of shared experience. The story can at times communicate in few words that which a dense, technical analysis might require many lines to accomplish. (p. 708)

But what about scientific concepts and ideas? There is a difference between history or literature and science, although, it might be argued that, even in the case of history, children should learn the truth about the world from reliable sources, not through stories. Objectivity appears to fly in the face of narratives since the latter in-

volve always an element of personal interpretation.

Yet despite this element of interpretation, the link between science and myth leads one to reconsider one's notion of truth. Although it is beyond the scope of this article to analyze and discuss the ideas of objectivity and truth, it is worth pointing out that

Today's science is built upon yesterday's science, and yesterday's science upon the science of the day before. And the oldest scientific theories are built on pre-scientific myths. (Popper, 1972: p. 346)

The scientific theory that is used to explain, for example, the connection between volcanoes, earthquakes and mountains is rooted in the myth of the Titans. It is well known from Greek mythology that the ancient Greeks were aware of a link between those phenomena, and that they created a myth to explain them. This is the myth of the Titans, a tribe of giants, who were imprisoned by Zeus underneath the mountains, and, in their attempt to escape, began to throw big rocks at Zeus. Although the scientific theory of today does not postulate the existence of angry giants who move and throw rocks, the hypothesis that there is movement of tectonic plates is not different from the story of the ancient Greeks. Bruner (1986) makes this point quite explicit: "Many scientific and mathematical hypotheses start their lives as little stories or metaphors" (Bruner, 1986: p. 12). He also argues that a scientific theory and a well-made story "are two forms of an illusion of reality" (p. 52). Egan (1999b) argues that if rationality is considered the natural way of thinking, "then clearly most of humanity most of the time have been involved in massive confusion" (p. 5).

It is no coincidence that over the last two decades the importance of imagination and intuition, and the role of the right hemisphere in general in the process of knowing have been seriously considered (Bruner, 1986; Clocksin, 1995; Egan & Nadaner, 1988; Egan, Cant, & Judson, 2014; Eisner, 1985; Levy, 1985). Bruner (1986), in fact, argued that there are two distinctive modes of cognitive functioning, the narrative and the paradigmatic; the former gives rise to story telling, and the latter to logic and science in general. However, although these two modes of thought are irreducible to one another, they are complementary.

These ideas lead one to consider the story-line approach as an excellent way to help children understand certain ideas about science. For young children a story is not just a powerful tool but a pedagogical necessity. As Egan (1979: p. 2) points out, "young children require a story form. They require a beginning that sets up an expectation, a puzzle, a problem, or what writers call a sense of tension". Topics, according to Egan (1988, 1994, 1997), embedded in a context capturing the imagination of the child, should be presented in such a way that the child perceives the conflict between two binary opposites (e.g., good and evil, big and little, hope and despair, security and fear).

A mediating process between binary opposites appears to facilitate the understanding of a large range of phenomena. For example, through a mediation process between "hot" and "cold" children learn the concept "cool", in the same way that through a mediation between living and dead things children learn the notion of "ghost" (Egan, 1999b). This mediation process between two opposites appears to be central in the process of meaning making (Odgen, 1967). Egan (1988) gives the example of heat that could be presented to children in a story form through a conflict between heat as a destroyer and heat as helper. Apparently, Egan's idea of binary opposites, can be used to introduce children to a large number of scientific ideas. This can be done if stories are built on conflicts between such concepts as light and shadow (darkness), heavy and light, motion and rest, energy as something good and energy as something bad, water that stays still and water that is in constant motion, could be used for the introduction of science concepts to young children.

Egan is a fervent exponent of the idea that instead of thinking of a lesson or unit as a set of instructional objectives to be attained, teachers should think of it as a good story to be told to the children. Egan (1997), in fact, proposes that educational development should proceed in the following four stages: mythic, romantic, philosophical and ironic stage. Children, according to this four-stage model, should begin to learn about the world through the great stories of the world. Whether or not Egan's ideas are challenging, their importance for the early childhood curriculum is quite indisputable, since orality plays a primary role in early childhood. In addition, his ideas necessitate a reconsideration of the capacities of young children, and provide food for thought for those interested in helping children construct a foundation for science concept development.

A feature of young children's mental life that is commonly asserted as an implication of research on their logico-mathematical thinking is that their thought is perception-dominated. If we focus instead on their imaginative lives we see rather an enormously energetic realm of intellectual activity that is conception-driven. (Egan, 1999b: p. 9)

However, what is perhaps equally important is that stories, especially when they violate everyday reality (e.g., through unfamiliar, mysterious, remote and strange objects and situations), can provide children with a sense of wonder (Hadzigeorgiou, 1999, 2001, 2014; Womock, 1989). This sense of wonder can secure the “romantic” engagement with the scientific ideas, which, according to Whitehead (1929), is a necessary step before children can begin to study science in detail at a later stage in their education. If the goal of early childhood science education is to provide opportunities for children to build the foundations for scientific knowledge, then attention should be paid to those characteristics of children’s mental life that facilitate this construction process. These characteristics are curiosity/wonder and imagination, and they can both be developed and sustained through exciting stories, in which science concepts and ideas have been embedded.

#### 4. Final Comments

Although the growing interest in science activities for young children is welcome, this interest could become manifest in two extreme ways, something that should be avoided. One can spend one’s lifetime trying to find effective ways to introduce children to science concepts and ideas, taking, of course, into account both the limitations in children’s thinking and their preconceptions about how the world works. Or one can spend one’s lifetime designing interesting activities that might appeal to young children. Following the first rationale, one will probably never design a single activity, while following the second rationale one will design too many. Both approaches are extreme and should be avoided.

Certainly, Jerome Bruner’s (1966) famous dictum that “any idea or problem or body of knowledge can be presented in a form simple enough so that any particular learner can understand it in a recognizable form” (p. 46) has been a real challenge for any educator genuinely concerned with learning. This dictum is certainly a bold hypothesis. Can we teach the theory of relativity to five or six year old children? Can we help children understand Newton’s Third Law and the Second Law of Thermodynamics? Yet Bruner (1963), had remarked in regard to his hypothesis: “No evidence exists to contradict it; considerable evidence is being amassed that supports it” (p. 33).

Today Bruner’s hypothesis appears to be more realistic than it was twenty or thirty years ago as findings from cognitive psychology support the Vygotskian view that learning can occur in advance of development. For there is evidence that learning does not depend so much upon the level or stage of cognitive development of the child as upon the representations he or she has about a certain subject or topic, and the strategies he or she uses to process information (Berg, 1993). The guidance that the child receives from adults or more knowledgeable peers also plays a crucial role in the process of learning (Berk & Winsler, 1995; Bruner, 1985; Flear, 2009, 2013; Hadzigeorgiou, 2015; Hodson & Hodson, 1998; Navarra, 1955; Rogoff, 1990).

The important question to be asked, however, is not whether children can be introduced to advanced ideas, but whether, through their participation in science activities, they have the opportunity to develop, and, at the same time, to be helped to construct the foundation upon which the development of science concepts will take place. In regard to the development of children, the activities should provide opportunities for cognitive, emotional, physical and social development. In regard to the foundation of scientific knowledge, the activities should provide opportunities for the construction of relationships between fundamental concepts, and for the development of attitudes and skills.

Although the movement of objects and stories represent a restricted repertoire of activities, they can nonetheless be considered pedagogically more appropriate activities, in the sense that they can help children construct the logico-mathematical framework necessary for concept construction and develop their imagination, which is an important element in this construction process. Moreover, both activities can also be considered from a socio-cultural/constructivist perspective, which is based upon the collective—not the individual—nature of learning (see Flear, 2009, 20013; Flear & Pramling, 2014).

Certainly, the construction of relationships can result in knowledge that lacks the coherence of scientific knowledge. The understanding, for example, of a situation involving the collision of two bodies necessitates the construction of relationships among a number of various concepts (e.g., mass, force, velocity, length, time). Even in a relatively simple everyday situation involving the free fall of an object there can be so many relationships constructed by children (e.g., relationships between time and speed, between height and speed, between height and time, between height and force exerted the moment the object hits the ground) that a reorganization is imperative if scientific understanding is the goal. Yet this does not imply that children cannot be helped to organize their thinking by constructing relationships or linkages among concepts that have some coherence (see

Eschach & Fried, 2005; Leuchter et al., 2014; Trundle & Sackes, 2015). It does not follow that children cannot be helped to construct understanding by participating in appropriately designed activities that deliberately engage them in relational thinking. The idea of “construction of understanding” (see Hadzigeorgiou, 2015), which is compatible with both the actional and the relational view of scientific concept (Gilbert & Watts, 1983), not only points towards the importance of relationships, but also has serious implications for pedagogy: children should be encouraged and helped to put various factors and ideas in relationship.

No mention of course, has been made of the role of science skills like observing, describing, recording, hypothesis testing etc., or the role of values and attitudes. Yet it is quite evident that both story-telling and activities with the movement of objects do help children develop both attitudes and skills. Curiosity, for example, can be developed if children listen to interesting science stories, and skills can be developed through children’s participation in activities involving the movement of objects. Moreover, through storytelling and the movement activities emphasis is placed not on sense experience but on children’s mental actions.

Although it is true that science involves looking closely at an object (e.g., a worm, a magnet, a mirror) or an event (a pendulum swinging back and forth, a melting piece of ice, a ball rolling down an incline), and that children’s thinking process does start with observation (children have first to observe an object or situation before they can describe the object and certainly before they understand what is going on in the situation, which factors are involved in this situation, let alone form hypotheses, investigate and test their ideas), there is the possibility, for children to rely heavily on inductive reasoning. However, the epistemology of empirical inductivism has suffered a strong blow over the last decades (Chalmers, 1982, 1990; Driver, 1994) since it was recognized that many scientific concepts are imaginary constructions rather than the consequence of any direct observation. Ausubel, Novak and Hanesian’s (1978) idea that when “young children are discovering principles inductively, they are really attempting to use empirical evidence to confirm their existing preconceptions” (p. 538), is not only an argument against the epistemology of empirical inductivism but also a warning for educators, particularly those in preschool education. Children’s egocentric and animistic beliefs undermine the view that they can actually observe and understand physical phenomena.

Given the complementarity of the two modes of cognitive functioning, it is apparent that even the generation of hypotheses is not due exclusively to logico-mathematical thinking. The idea that a hypothesis comes first, as an imaginary construction, and that the data of observation are used to validate the hypothesis (Phenix, 1964; Popper, 1972) does lead one to reconsider the development of scientific skills as the most important element in early childhood science education. For Copple, Sigel and Saunders (1984), the development of these skills in young children is equivalent to the development of their mental capacities. Attention, however, should be paid to the role of observation and sense experience in general. For emphasis on sense experience might have the opposite result, that is, the neglect of both logico-mathematical thinking and imagination (Hadzigeorgiou, 2015). Egan’ (1999a) view, that the neglect of the imagination in the early years can explain failure in science and mathematics later on should be seriously considered.

A closing argument for the priority of activities involving the movement of objects and storytelling, regards the teachers’ capacity to implement them. Given the bleak picture of early childhood teachers’ confidence to teach science in general (see Fleeer, 2009; Gerde et al., 2013), the proposed two approaches seem to help teachers become more confident about physical science teaching in the early years (Hadzigeorgiou, 1998, 2004). Perhaps, this is a kind of teachers’ confidence in implementing science activities in early childhood education is.

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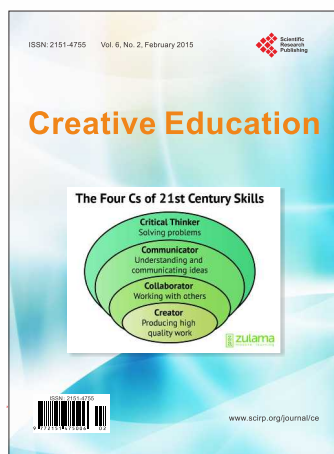
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# Creative Education

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