

Can ICT help Cambodian students become the solution for improving education in the country?

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Abstract

We are entering the fourth industrial revolution and Cambodia needs to be ready. Technologies are changing not only the way we do things but our entire life. One of the spheres affected by this revolution is Education. “Education is the movement from darkness to light”, said Professor Allan Bloom, and Cambodia is still in the shadow. The low percentage of its Gross Domestic Product (GDP) doesn’t provide enough resources to all the schools and the young generations are affected by this. But, can Cambodia try to resolve this problem beginning from the resources it already has? Recognized theories and researches proofed the effectiveness of learning by teaching, so why Cambodia doesn’t use this as a resource and an opportunity? ICT can change and it is already changing education, and with the help of students, it can make the difference in the country. In this paper, we provide an overview of the education within the country, and we analyze the possibilities and issues that Cambodia can have and would face along the way of preparing itself for the fourth industrial revolution.

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Introduction

Cambodia has a long past with a troubled recent history. After the genocide committed by the Khmer rouge around 40 years ago, in the recent days, as reported by the (The World Bank, 2018), Cambodia has attained lower middle-income status (in 2015), with gross national income (GNI) per capita reaching \$1,070. Mainly through garment exports and tourism, Cambodia has sustained an average growth rate of 7.7% between 1995-2017, the sixth fastest-growing economy in the world (The World Bank, 2018). Economic growth is expected to reach 7% in 2018 compared to 6.9% in 2017, as global demand peaks, and remains robust over the next two years (The World Bank, 2018). The poverty rate dropped from 47.8% in 2007 to 13.5% in 2014, but still, around 4.5 million people remain near-poor in Cambodia (The World Bank, 2018).

But still today, Cambodia's education system is behind compared to its Association of Southeast Asian Nations (ASEAN) neighbor countries (Tan, 2007). In Cambodia, the preparation of high school teachers, mainly in the provinces, is very poor (Sem & Hem, 2016) negatively affecting those instructors that struggle to deliver quality learning experiences to their students.

It is not a secret that one of the most effective ways to solve the problem is to increase the expenditure in the Education sector, but this is easier said than done. A first step in the right direction would be to begin considering the resources already available or easy to access. We know that one of the best ways to learn is by teaching. This is not something new. Seneca the Younger (4 BC – 65 AD), said in his Letters to Lucilius, Book I, letter 7, section 8: "Homines dum docent discunt", which literally means "men learn while they teach". In (Koh, Lee, & Lim, 2018) the authors supported the idea that the learning benefit of teaching is simply another manifestation of the well-known "testing effect", which means that bringing to our mind what we have already learned in previous experiences, leads to a deeper and longer lasting acquisition of that knowledge.

At the same time, it is really important to consider the advent of what represents a new era: the Fourth Industrial Revolution (4IR). The 4IR is emerging out of the third revolution but is considered a new era rather than a continuation because of the explosiveness of its development and the disruptiveness of its technologies (Schwab, 2016). Our life is changing incredibly fast through the exponential growth of Information Communication Technology (ICT) and our life and our way of living are changing accordingly with new technologies. Education is a very important component of our life and our society and it has been affected by technology as well. For this reason, it is very important to drive this change into very positive things.

In this paper we want to analyze the situation of education in Cambodia, considering possible solutions for making improvements, using ICT and students as resources to underpin this growth.

1. Education in Cambodia

Cambodia has a long history, harking back to the Funan and the Khmer Empire which left to us one of the most marvelous remains of the ancient world, Angkor Wat. After becoming a protectorate of France for almost 100 years, Cambodia gained its independence in 1953, with King Sihanouk becoming the ruler for nearly 2 decades. In 1970 General Lon Nol, supported by the United States, led a coup d'état and took over power in 1970 until the rise of the Khmer Rouge led by Pol Pot. During those years under the control of the Khmer Rouge, almost 2 million people died, sending Cambodia's development back one hundred years. Cambodia was left with the peculiar scenario of having experienced a decimation of the intellectual elite, leaving a crippling and unprecedented legacy of inadequately trained or completely untrained management personnel (Gottesman, 2004). In the last ten years of the past century, millions of dollars were poured into Cambodia from donors and financial institutions until the clash between Hun Sen and Prince Norodom Ranariddh. As a consequence, the flow of money inside the country came to an end. In 1998 democratic elections took place and they proclaimed Hun Sen as First Minister of the Kingdom of Cambodia, a position he still holds today. In the last 2 decades, Cambodia improved dramatically and with it, also its educational system. Since the 1990s many dollars from donors such as the International Red Cross and UNICEF helped to rebuild thousands of educational institutions and to train thousands of teachers (Tan, 2007). However, the education system is still lagging behind and on top of that, a 2010 comparison study between the South East Asia countries, showed that Cambodia spent the equivalent of 2.6 percent of its GDP on education, below Laos (2.8%), Thailand (3.8%) and Vietnam (6.3%) - most Western countries fall between 5.5% and 6.4% (Wirth, 2014).

Education plays the most important role in the social development of a nation (Sovanak, Vouchsieng, & Navy, 2017). As a matter of fact, education is one of the best elements for nurturing the basic needs for human development and to escape from poverty (Sivakumar & Sarvalingam, 2010). Carmignani (2016) showed how countries that spent more on education as a proportion of Gross Domestic Product (GDP) in 1990-99 experienced faster growth in the subsequent decade. More precisely, an increase in education expenditure by 1 point of GDP (eg from 4.5% to 5.5%) increased GDP growth by 0.9 percentage points (eg from 4.5% to 5.4%) (Carmignani, 2016). In Sovanak et. al (2017) the authors stated that many educators, researchers, and legislators in Cambodia believe that students from rural areas of the country receive an education that is inferior compared to the students that live in urban areas. To support this statement, Sem & Hem (2016) showed that almost all secondary teachers in Cambodia have completed at least grade 12, while 18% have some post-secondary education, while younger teachers tend to have reached higher educational achievements. Though, still, most teachers achieve only low-level C, D and E markings on the grade 12 high school examination. In 2017, around 18,000 teachers were found to be university graduates, 51,820 teachers upper secondary graduates and 19,267 lower secondary school graduates (MoEYS, 2017). Finally, there are 1,779 teachers who have only attended primary school (MoEYS, 2017). It is clear that if these educators have limited knowledge, they are

constrained in what they are able to share with their students, as the authors in Sem & Hem (2016) pointed out, the future and growth of the country suffers in accordance with this. Additionally, education in Cambodia does not focus enough on Science, Technology, Engineering and Mathematics (STEM). This lack of concentration on STEM, results from a prior focus on administrative skills as introduced by the French (Kalyanpur, 2011). This represents the footprint of the educational system brought from France to Cambodia, under the guise of egalitarianism and increasing access to education (Ayres, 2004). The main purpose in terms of instruction and curriculum of French, was to groom students for the elite colonial civil service (Ayres, 2004). In 1944 only one engineer in the country was Cambodian (Kalyanpur, 2011). Even after education was made compulsory by King Sihanouk, the changes to the educational system in the country were merely cosmetic, asserts Ayres (2004), with the French orientation remaining unchanged. The historical tradition of “noblesse oblige” has segued into a network of loyalty among the survivors from the Khmer Rouge period, creating a new elite of the well-connected and this, together with a shortage of educated personnel implied that many ministry staff were appointed to their position even if they had neither received any training in pedagogical skills themselves nor ever taught in a classroom (Kalyanpur, 2011). Teachers were no longer the intellectual elite, and they have little status in the contemporary society (Kalyanpur, 2011).

2. Learning by doing and by teaching

Learning by doing and learning by teaching are two concepts that are very important for human education. Safiye (2015) stated that an important issue facing educators is how to provide individuals with effective learning opportunities so that they may gain and retain the above-mentioned skills. Much research cited in Fiorella & Mayer (2013), shows that teaching others can be an effective way to learn but at the same time, it is not yet clear the reasons for this effect. Fiorella & Mayer (2013) classified three main typologies of learning by teaching: learning by preparing to teach, learning by teaching itself and theory and predictions. Regarding the first one, the existing literature provides some support for teaching expectancy effects, suggesting that studying with the expectation of later teaching may play a critical role in determining the overall effects of learning by teaching (Fiorella & Mayer, 2013). The second one focuses on the benefits that peer tutoring provides for the tutors and at the same time for the tutee (Rosco & Chi, 2007). The last one instead regards the idea that deep learning occurs when learners engage in appropriate cognitive processing during learning, including the selection of relevant material, mental organization into a coherent structure in working memory and the integration with prior knowledge (Fiorella & Mayer, 2013).

In Skinner (1994) the author reported a method for learning by teaching which was then implemented in secondary education and even in higher education in Germany. This method is based on the idea that the responsibility of teaching should be undertaken by students for their own

classmates and adopts all the concepts for controlling all processes of a lesson by learners (Safiye, 2015).

A very interesting project has been started by Teach for All, a group of over 40 independent institutions with the vision of developing collective leadership to improve education and expand opportunities for all children, so they can shape a better future for themselves and the world around them (Teach for All, 2018). Each partner recruits and develops leaders to teach in their nations' most high-need classrooms and to work throughout their lives to increase opportunities for kids (Teach for All, 2018). Teach for Cambodia was the fifth to join in the ASEAN region after Malaysia, The Philippines, Thailand, and Vietnam. The program which adapts to community needs and is student-centered, recruits recent graduates from universities around Cambodia and provides them a period of training, and then assigns them to teach young students in schools with few possibilities and low resources for a period of two years. This approach gives the university graduates an opportunity not only to help their younger peers develop their skills but also the chance to apply what they learned during their undergraduate studies, reaching the highest levels of the SOLO's Taxonomy (Biggs & Collis, 1982). This gives the students teachers a way to not only remember and understand the concepts, but also apply, analyze, evaluate and create something real, like a lesson. Of course, an effective, engaging learning experience requires a good learning design process that follows the UDL (Universal Design for Learning) guidelines (CAST, 2018). Universal design for learning is placed in the middle between representation (it provides multiple means of representation), action & expression (it provides multiple means of actions and expression) and engagement (it provides multiple means of engagement). Furthermore, instructors should seek to minimize extraneous cognitive loads and should consider the intrinsic cognitive load of the subject when constructing learning experiences, carefully structuring them when the material has a high intrinsic load (Brame, 2015). It would be helpful if universities would offer the "student-teachers" training and hands-on practice in a few educational theories prior to placing them in the schools. This practice would very easy for universities to adopt.

Cambodia is still spending only 2.6% of its GDP on education and many schools, mainly in the provinces, lack resources, human and technological ones. Adopting university students as educators for those schools in need can represent a solid step forward in order to achieve those goals set by the Ministry of Education, Youth and Sports (MoEYS), while at the same time provide a real learning experience for those students who can benefit and learn from teaching.

3. ICT in education for Cambodia. Chimera or reality?

ICT applied to education are all those technologies, including the computer, Internet, broadcasting technologies and any others that can facilitate the delivery of instruction and the learning process itself (Khan, Hasan, & Clement, 2012), and at the same time promote international collaboration and networking in education and professional development. The Ministry of Education, Youth and

Sports of the Kingdom of Cambodia, has already expressed its long term vision to ensure equal access to basic education for all citizens and to prepare them to play active roles in reconstructing the country as well integrating Cambodia into the knowledge-based global community (MoEYS, 2004). In the last decade the MoEYS began many initiatives in order to facilitate greater integration of information and communication technology (ICT) (MoEYS, 2004) but the wicked problem of few funds, mainly in the public schools, creates many difficulties to reach such goals. With a population of 16,13 million people and 8 million Internet users, which means a penetration of 50% (Hootsuite, 2018), a basic understanding of ICT and its use, could facilitate the improvement of education in Cambodia. Empirical studies confirm that education can make an important economic contribution and this is found in both macroeconomic and microeconomic analyses (Kozma, 2005). Psacharopoulos and Patrinos (2002) found that an average rate of return for an additional year of schooling was a 9.7 percent increase in personal income. Cases, like Singapore and Finland, can represent perfect examples of growth in education together with economic growth. Curriculum reform, pedagogical reform, assessment reform, teacher professional development, and school organization represent important steps for achieving a solid education growth (Kozma, 2005). The use of ICT supports the delivery and access of information and the creation of knowledge, both of which represent ways for Cambodia to achieve the goals set by MoEYS. For example, with the UNESCO-UNICEF Gobi Desert Project in Mongolia, 15,000 nomadic women used the radio to receive an education in literacy skills, livestock rearing techniques, family care, and basic business skills (Kozma, 2005). Cambodia has a good penetration of Internet (around 50% at 2018) and this can be used as an advantage together with ICT knowledge provided by university students to young students in schools affected by the lack of resources. This can represent a win-win opportunity for the country. The use of ICT offers powerful learning environments and can transform the learning process so that students can deal with knowledge in an active, self-directed and constructive way (Volman & Van Eck, 2001). ICT can enhance education in many ways, enabling the effective storing of information, reducing the quantity of information, facilitating a better structure, being integrated into teaching and learning strategies and it can be used to create new types of interactive learning media (Khan, Hasan, & Clement, 2012).

The introduction of ICT in education would encounter many difficulties, mostly in developing countries such as Cambodia, similar to the case of Bangladesh, reported by Khan et al. (2012). Lack of resources, insufficient funds, the absence of vision and plans, political factors, social and cultural factors, corruption, teachers' attitudes toward ICT, and lack of time and skills are some of the problems that can be faced by Cambodia during the process. The latter, which is not expected to graduate from its Least Developed Country (LDC) status until after 2025, as stated in a report by a UN agency (de Gaudemar, 2016), is going to face all the aforementioned problems during its growth.

But this represents an interesting challenge for the Kingdom of Cambodia. A similar approach to the one of teach for all could be undertaken by Cambodian students as a normal practice. This activity should be carried out in groups in accordance with one of the seven principles of learning (Dumont, Istance, & Benavides, 2010): the social nature of learning. In fact, in (Dumont, Istance, & Benavides, 2010) it is stated that cooperative group learning that is well organized and challenging has clear benefits for achievement as well as behavioral and effective outcomes. Giving to Cambodian students the chance to apply their knowledge by teaching to others represents a perfect experience of learning by teaching and of incidental learning (Baskett, 1993). This approach could benefit Cambodian students' learning activity, producing great results in their learning outcome. At the same time, it could help those students enrolled in public schools located in the provinces, giving them the chance to benefit from the learning activities of the college students.

This approach to education could become part of a larger initiative to adopt some "novel" pedagogical methodologies in Cambodia, helping its educational system to improve. This represents a severe problem and as the authors in (Rittel & Webber, 1973) suggested, any question related to a potentially wicked problem should not be about a conclusive truth or solution, but instead an inquiry phrased as "Is this the right thing to do?" I believe so. Maybe Cambodia has in its students and in technology the solution to move forward in education, aiming to fill the gap between itself and the other countries of the ASEAN region.

4. Is there a place for ICTs in assessment in the 4th industrial age?

The idea behind assessment is to try to give an answer to one question: how do we really know that learning has taken place? To answer to this question, we first need to understand what learning means. The Higher Education Academy (HEA) has developed a framework for transforming assessment in higher education (HEA, 2016). This framework defines the principles that HEA defined as the foundation of the transformation of assessment practice. This framework helped to identify fundamental principles for the transformation (HEA, 2017): assessment for learning, aligned and fit-profit purpose assessment, collaborative construction of standards, integrating assessment literacy with learning, defensibility of professional judgments and the limit of assessment itself. Learning and assessment can't be two different entities but they should be fully aligned (HEA, 2016) in order to be fit-for-purpose. This happens when the assessment methods focus on the demonstrable achievement of intended program outcome (HEA, 2016). The constructive alignment between outcomes, teaching, learning, and assessment is necessary to achieve consistency and coherence in the design process (Tam, 2014). Thus, the learning design of the learning activity must proceed side by side with the creation of the assessment. Learning design is defined as the description of the teaching-learning process that takes place in the unit of learning, which can be any instructional or learning event of any granularity, like a course, a

workshop or a lesson (Koper, 2006). In short, we can define the instructional design as the process that aims to optimize the appeal, effectiveness, and efficiency of the learning experiences. This process must take into account the assessment capable to create constructive alignment as defined in Tam (2014) which should fulfill its purpose. Ideally, the form of assessment on a particular module should be determined by the design of the module and in particular by the module's intended learning outcomes (HEA , 2017), which are defined as something that can be observed, demonstrated and measured (Melton, 1996). The assessment methods thus, can't simply follow standards which, even if important and accepted as a necessary component for the creation of assessment, are usually generic, poorly articulated and difficult to use (Sadler, 2014).

But is testing really necessary? At which point should we start testing? And are we testing the right things to prepare learners for the 4th industrial age? Historically, the usage of ICT in the assessment was introduced to improve efficiency and reduce costs of large-scale testing (Pellegrino & Quellmalz , 2010). Step by step the usage of ICT in assessment moved to tools for developing tests and online portfolios. There have been some works that attempted to create the guidelines for future directions (Woolf, 2010), but there is still the issue that much emphasis is on using technology for efficiency and consistent delivery rather than for rethinking the relationship between learning and assessment (Timmis, Broadfoot, Sutherland, & Oldfield, 2015). Timmis et al. (2015) suggest many opportunities afforded by technology-enhanced assessment, like the capability to represent knowledge and skills in many ways, the capability to introduce crowd sourcing and decision making in assessment, increased flexibility in space and time, supporting collaboration, innovation in recording achievement and exploiting learning analytics locally and nationally. According to Khairil and Mokshein (2018) the use of technology in support of assessment should be promoted over the use of the traditional pen and paper type of assessment.

Relating to this last topic, another discussion arises, regarding the importance and effectiveness of high-stakes testing versus low-stakes testing. There are a number of different purposes that assessments serve, and different characteristics are dependent on the level of information required (Howie, 2013). At the student level it can be used to describe students' learning and to diagnose learning problems, while at the system level, the main purpose would be to reach a judgment on the effectiveness of an education system or part thereof, which is primarily the interest of governments and policymakers (Howie, 2013). This discussion has been brought up in the UK by the Assessment Reform Group (Torrance, 2009). Rowntree (1987) said that if we wish to discover the truth about an educational system, we must look into its assessment procedures. Two very interesting scenarios are represented by Finland, which scored high in the Program for International Student Assessment (PISA), and Japan. According to the Finnish National Board of Education (2009) the role of assessment during courses is to guide and encourage studying and to depict how well the pupil has met the objectives established for growth and learning. The assessment in Finland is based around improving instruction and the majority of the assessment is formative or used to improve instruction and learning (Hendrickson, 2012). This represents a very

interesting scenario to analyze in order to understand if summative assessments are really that important and if so, how to adapt them and make them aligned with the learning activity and learning outcomes. This is a trend that other countries may follow in the future and we, as teachers, need to think deeply about it. Japan, according to S.R. Enrich (2015), explored the reality of shadow education. Shadow education, which is a set of educational activities that occur outside formal schooling and are designed to enhance the students' formal career (Enrich, 2015), demands high economical investment, which can foster educational inequality (Konakayama & Toshihide, 2008) in Japan. Howie (Howie, 2013) stated that on the basis of the international experience and observed local behavior, high-stakes testing should be avoided for as long as possible in South Africa, for it is not yet at a mature level to increase the testing stakes. This same kind of question needs to be considered as well in Cambodia. Technology can support nearly every aspect of assessment in one way or another, from the administration of individual tests and assignments to the management of assessment across a faculty or institution; from automatically marked on-screen tests to tools to support human marking and feedback (JISC, 2014).

5. ICT and Cambodian students with Challenges

A learning disability may refer to: retardation, disorder, or delayed development in one or more of the processes of speech, language, reading, writing, arithmetic, or other school subject resulting from a psychological handicap caused by a possible cerebral dysfunction and/or emotional or behavioral disturbances (Kirk & Bateman, 1962). It is not the result of mental retardation, sensory deprivation, or cultural and instructional factors (Kirk & Bateman, 1962). After this definition, many others have been provided regarding learning disabilities. As a consequence of the Dakar World Education Forum goal of Education for All (EFA) by 2015, many developing countries, Cambodia included, are focusing on including children with disabilities in their educational system (Kalyanpur, 2014). However, Cambodia, similar to other developing countries, does not yet have a medical sector capable of responding to some disabling conditions, such as epilepsy and cerebral palsy, which are often attributed to spiritual causes, especially among more traditionally minded people in rural areas (Kalyanpur, 2014). We live in a knowledge-based society, where access to information and the ability to make economic and social transactions confers a distinct advantage (Warren, 2007). It is important to use ICT in order to overcome the misconceptions about disabilities in rural areas of Cambodia and at the same time using ICT for helping those students affected by these disabilities to overcome them and be capable to learn. ICT has the potential both to enhance access for people with disabilities and to contribute to creating barriers (Simpson, 2009). It is important to remember that people with disabilities have many different accessibility needs and that there are different ways to make technology accessible and that new accessibility needs to emerge as technology changes (Simpson, 2009). ICT can be used to support those people affected by learning disabilities answering in this way in order to achieve the goals set by the Dakar World Education Forum goal of Education for All.

In Dovis et.al (2015), using a gamified training intervention (Braingame Brain: BGB), the authors obtained an improvement in visuospatial short-term memory, working memory, inhibitory performance, and interference control, which are classified as executive functions, in children affected by Attention Deficit Hyperactive Disorder (ADHD). Furthermore, the improvement of these executive functions lead to positive results, especially on ADHD behavior, but also on the cognitive and academic outcome (Rapport, Orban, Kofler, & Friedman, 2013) . ICT can be also used for helping students with reading impairment, especially dyslexia. For example, using a combination of Prizmo, Easy writer/Pages, ITranslate, SayHi ad Dragon Search applications Lindeblad et al. (2016) showed that assistive technologies can create transfer effects on reading ability. This means that reading-impaired children may develop at the same rate as non-impaired readers through the adoption of ICT. Furthermore, when individuals have severe speech and language disabilities, augmentative and alternative communication strategies (AAC) can provide them with an opportunity to express themselves and have a voice (Brown Lofland, 2018). In fact, the inability to communicate has a significant impact on quality of life, educational access, development of social skills and relationships, and frustration of not being able to communicate can lead to negative behavior challenges as well (Brown Lofland, 2018).

These are only some of the many examples that prove how ICT can help and support students with disabilities in Cambodia, allowing the country to meet the goals set at the Dakar World Education Forum goal of Education for All. At the same time ICT can help those Cambodian students left behind in the educational process, disabled people that are among the most vulnerable groups in Cambodian society, lacking equal access to education, training, and employment (Pozzan, 2009).

Conclusions

In this paper, we wanted to provide an overview of the education sector in Cambodia and propose feasible ways to use internal resources for improvement and hopefully thereby reduce the educational gap between Cambodia and its ASEAN neighbors. Cambodia is still spending too little of its GDP on education, which can seriously affect the future of the younger generation and at the same time the overall growth of the nation. One of the best ways to increase the country's educational standard would be to increase funding to the level of neighboring countries. But before thinking about increasing the percentage of the GDP contribution, Cambodia could begin by utilizing its own human resources: its students. Cambodian university students could be trained to serve as volunteer part-time "teachers in training" in those schools without enough resources. Surely students in colleges or universities need to be properly prepared before beginning their teaching activities, but this would not be a difficult obstacle to overcome if a program similar to the one proposed in this paper would be implemented at a national level. Obviously, Cambodian college / university students can not represent the solution to all of the educational shortcomings within the country, and they cannot be considered the ultimate panacea for a failing system. Innovative policies, higher teacher salaries, professional training programs, with a monitoring and

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evaluating framework needs to be implemented as well. But surely the Cambodian students can represent a first, low-cost step toward addressing the lack of prepared teachers in the provinces.

In summary, this paper attempts to present a discussion highlighting the possible solution(s) that ICT and Cambodian university students could bring to the under-performing education and health care sectors as we approach the 4IR. ICT can be used as support to deliver the best learning experiences to students, facilitating at the same time access to information and the ability to cooperate. Finally, ICT can represent a powerful way for including those students affected by learning disabilities in learning activities, without having them feel isolated from society.

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