



Research Article

# Emerging Trends, Challenges and Innovative Approaches for the Next Millennium

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## Abstract

This paper intends to verify the conclusions of the experts in North-American context regarding the perceptions of the trends, challenges and information technologies developments of the university professors, instructors, administrators, educators and graduate school students in Philippines. The concept of the study is built on the work of the six important trends expected to impact the education sector, six (6) challenges faced by policy makers, managers and teachers and six (6) significant developments to come in the next few years. A questionnaire was derived from the topics used by the 2017 report from The New Media Consortium which is composed of three sections: trends (16 items), challenges (19 items) and developments in technology (20 items). The fourth section dwells on the socio-demographic profile of the respondents. Statistical analyses using percentages was utilized to explain the data gathered. Results indicate that Philippines educators have similar perceptions as the international experts in terms of trends accelerating the adoption of technology in higher education, challenges to new education vision and the importance of coming developments in technology for higher education. The revolution and emergence of the new paradigm in education brought by technology as catalyst of change is something that Filipino educators look forward and develop through innovation.

**Keywords:** Information Technology, Education, Trends, Challenges, Developments.

## Introduction

The Technology for learning is now commanding a world budget of 3% of the total expenditure in education (estimated to 8 Trillion in 2025) and the Global education technology market should grow to reach \$342B by 2025 (HolonIQ, 2019). According to Darling-Hammond (2019), the growing introduction of technology in education is inevitable, and is actually growing at a rate of 15,4 (BusinessWire, 2018). The use of technology to support or to give learning is not a new phenomenon, but the last decades have seen the growing interest for the use of technology in the classroom (Kintu et al., 2017).

According to a survey of 1254 principals of Ontario (Canada), almost all teachers communicate with their students through technology and 66% encourage students to Bring Your Own Device (BYOD) (although it

is still a controversy) and the use of Internet is mandatory for two-thirds of the language students (People for Education, 2019) and lately the government decided that each secondary student would need to take 4 credits of e-learning. Dawson College in Montreal Canada inserted 1 million in the introduction of Artificial Intelligence (AI) in all its program (Rscapin Dawson, 2019). Robotic is proposed even at the elementary level, as done in St. Cloud, MN where two specialists teach K-8 students programming and robot control (Oropeza, 2019). Using Technology is normal for the millennium and the use of mobile is certainly the most powerful educational tool in any generation for it supports learning.

Education is at the turning point with the emergence of a new paradigm, according to Schleicher (2010) from the OECD Education Directorate in a conference:

*«What we learn, the way we learn it, and how we are taught is changing. This has implications for schools and higher level education, as well as for lifelong learning....Education is no more about reproducing content knowledge but extrapolating and applying knowledge to new situations»*

Indeed, the work skills needed for the 4<sup>th</sup> industrial revolution are totally different, and Education 4.0 is a necessity to deal with tomorrow's challenges as cited by Diwan (2017). As mentioned by Davis (2011), the main drivers of change are expected to affect the workplace in terms of an aging population, some needing to work while others are being asked to stay; the increase place taken by technology in daily life and work; the increase need for digital literacy to avoid dividing the society and the increase of computational power and spread, and lastly, the new forms of organization for enterprises allowing and asking for a new management of time and space in globally connected world.

It is interesting to note that some of the best jobs of today did not even exist ten years ago, namely: Iphone App developer, Social media manager, Social Media Influencer, Uber driver, Driverless car engineer, Cloud computing specialist, Big data analyst/data

scientist, YouTube content creators, Drone operators, Millennial generational expert, Director of Analytics, User Experience Director, Sustainability manager (Hallet & Hutt, 2016). Employers ask for more and more degrees to face their needs but get frustrated with the lack of appropriate skills of candidates, maybe due to the fact that diploma measures past knowledge instead of preparedness to job (Fadel & Echos, 2010).

While *education 1.0* was teaching through lectures and memorization, *education 2.0* introduced the usage of technology and Internet connection, *education 3.0* geared towards knowledge production while *education 4.0* is an innovative-production in education (Siltharm, 2017) which leads for developing countries to innovate in this twenty-first (21<sup>st</sup>) century. Thailand, as an example of developing country, oriented its higher education toward the following focus namely: enhancing country's

competitiveness, integrating higher education with manpower demand and country development, driving knowledge transfer for industry, and, in every sector, creating research outcomes contributing to the country's economic growth, generating innovation and producing quality manpower ready for labor market and the next generation of Thai industry.

These orientations are congruent with the conclusion of the work of the economist Schumpeter, who stated that one of the most influential factors in the development of the economy is innovation. The digital technology is seen as the most powerful competitive tool to improve economies and changed societies, but government engagement is critical in order to reap the benefits from what technology offers (Deloitte Insight, 2017).

According to Davis et al, (2011) from the Institute for the Future for the University of Phoenix Research Institute, the work skills needed from now on would be: 1) **Sense making** which means better understanding of the meaning 2) *Social intelligence* which is the capacity to interact with others in a useful way 3) *Novel and adaptive thinking* is thinking outside the box to solve new problems 4) *Cross cultural competency* means the capacity to work in diverse cultural environments and globalization settings 5) *Computational thinking* is the capacity to sort and use relevant data out of an increasing amount of data 6) *New Media Literacy* which is the capacity to use diverse media and technologies to produce new information 7) *Trans-disciplinary* is the capacity to work with data originating from diverse disciplines 8) *Design Mindset* means the capacity to plan and manage complex project to obtain certain result 9) *Cognitive load management* is the capacity to sort and manage useful information and 10) *Virtual collaboration* which is the capacity to operate in virtual teams.

The P21 partnership for the 21<sup>st</sup> century learning according to the National Education Association (NEA, 2015) which is a non-for profit organization includes educators, managers, policy makers, from the main enterprises in the United States

Department of Education, AOL Time Warner Foundation, Apple Computer, Inc., Cable in the Classroom, Cisco Systems, Inc., Dell Computer Corporation, Microsoft Corporation, SAP recommends to favor seven (7) key skills in their framework for the 21<sup>st</sup> century learning report namely; critical thinking and problem solving, creativity and innovation, cross-cultural understanding, communications, information, and media literacy, computing and ICT literacy and career and learning self-reliance.

Clearly there must be a change in the pedagogy to support those new needs. The old pedagogies aimed at mastering content should be replaced by new pedagogies favoring deep learning and content mastery (Fullan & Langworthy, 2014).

Academic literature, field experimentations, and actual realizations in several sectors seem to indicate that there is an added value between Education 4.0 and previous education methods. The added value is the increase in the readiness of graduates to occupy the new jobs required by the Industrial revolution 4.0 and improve the capacity to respond to challenges of the transition needed between actual enterprises functioning and their adaptation to survive. It is too soon to provide quantitative evaluation of the impact of Education 4.0 but too late to stop its emergence in response to the society.

### **The Pioneer Work of New Media Consortium and the EDUCAUSE**

For the last fifteen (15) years, New Media Consortium and the EDUCAUSE Learning Initiative conduct an examination of trends and emerging technologies. Their latest report is the result of deep discussions of 78 international experts from twenty-two (22) countries spread over five continents, engaged in an online modified Delphi methodology mediated by wikis. These high profile participants first initiated an extensive literature review, including not only academic papers but also, newspapers, reports and any other documents in order to be sure to include all relevant materials. This important amount of information is

submitted for discussion to identify the core sources for the focus of their mission such as trends, challenges and technology development in education. The result of all those discussions has been classified into 6 topics for each of these three concerns; first, is the key trends in accelerating the adoption of technology in higher education is divided into time horizon; secondly, is the significant challenges are classified according to their degree of solvability and lastly is the important developments in technology for higher education.

The time horizons in which the key trends in accelerating the adoption of technology in higher education is divided according to *short time* where there is blended learning designs and collaborative learning, *mid-term* where there is a growing focus on measuring learning and redesigning learning spaces and the *long-term* which is the advancing culture of innovation and deeper learning approaches. The significant challenges are classified according to their degree of solvability such as *solvable* which means improving the digital literacy and integrating formal and informal learning, *difficult* where there is achievement gap and advancing digital equity and *wicked* that is managing knowledge obsolescence and rethinking of the roles of educators. The important developments in technology for higher education may be one year or less using the adaptive learning technologies and mobile learning. It maybe two to three years if there is the Internet of things and next generation LMS or four to five years where there is artificial intelligence and natural user interfaces.

In order to verify the adequacy of the findings of Becker et al (2017), a web survey was created and broadcast to Philippine higher education sector. Thus, the objective of this study is to explore with a quantitative approach the perception of higher education professionals in terms of the trends, challenges and IT developments related to education in the Philippines. Specifically, it looked into trends in accelerating the adoption of technology in higher education, the challenges to the new education vision, the importance of new developments in technology for higher

education and the involvement with technology.

### Methodology

The quantitative method using descriptive research design was utilized in order to gather information in a fast and effective way. The research instrument used has been adapted from the qualitative study of Becker et al (2017) and was composed of four sections namely; trends with sixteen (16) items, challenges with nineteen (19) items and developments in technology with (20) items. Other socio-demographics regarding the gender and age of respondents, their role in education and some of their professional characterization variables were also included. It was decided to collect data through a web-survey which was elaborated with survey monkey in order to simplify and accelerate the data collection.

Convenient sampling was used in the study for an easy access for potential respondents who are members in the association of teacher education and graduate school students in Philippine higher education. There were one hundred ninety-six (196) identified respondents from the selected universities and colleges. However, there were only forty-eight (48) of them who participated in the online survey. An e-mail was sent to these potential respondents asking them to participate to the study by clicking a hyperlink. The first page of the questionnaire that explained the objectives of the study, provides guarantees about the confidentiality of their answers, and their right to cancel their participation in any time.

Data analysis was done using the quantitative approach in exploring the perception of higher education professionals on the trends, challenges and IT developments related to education in the Philippines with the socio-demographics of the respondents.

## Results and Discussion

### Trends

A portrait of the actual perception with a composite index of the degree on the

implementation of the key trends with accelerating the adoption of technology in higher education as measured by adding the answer choice “growing trend” to “already a major trend” is presented in Table 1 below.

**Table 1: Key trends accelerating the adoption of technology in higher education (n=48)**

Becoming a Trend in Philippines	don't know	not at all	growing	major	on going	not familiar
Collaborative Learning	0%	0%	13%	88%	100%	0%
Rethinking the Roles of Educators	0%	2%	50%	48%	98%	0%
Evolution of Online Learning	0%	4%	60%	35%	96%	0%
Blending Formal and Informal Learning	2%	2%	69%	25%	94%	2%
Students as Creators	2%	4%	58%	35%	94%	0%
Cross-Institution Collaboration	0%	8%	63%	29%	92%	0%
Ubiquity of Social Media	2%	6%	54%	38%	92%	0%
Deeper Learning Approaches	2%	4%	65%	25%	90%	4%
Rethinking How Institutions Works	0%	10%	52%	35%	88%	2%
Redesigning Learning Spaces	0%	6%	58%	25%	83%	10%
Growing Focus on Measuring Learning	2%	6%	48%	35%	83%	8%
Proliferation of Open Educ Resources	6%	4%	54%	29%	83%	6%
Decentralized IT Support	4%	11%	62%	21%	83%	2%
Blended Learning Designs	2%	6%	60%	21%	81%	10%
Ubiquitous Learning	4%	9%	68%	13%	81%	6%
Agile Approaches to Change	6%	8%	50%	25%	75%	10%

Most of the indicators of the Becker et al. (2017) are mostly addressed, especially for what was expected to be done. For the short time, one hundred percent (100%) answered for collaborative learning and eighty-one (81%) percent for blended learning design. In the mid-term, both growing focus on measuring learning and redesigning learning spaces is eighty-three percent (83%) which means that these trends are still growing and not yet a major realization for the educators in the academe. For the long-term, deeper learning approaches are seen as growing by 65% of the respondents or as a major trend by 25% of them.

It is worthy to note that ten percent (10%) of the respondents don't feel enough familiar with the notion of blended learning designs and redesigning learning styles,

which explains that these trends are judged less implemented than the others. With the advancement of technology, educators play a vital role in innovating classes to meet the demands of time. They are familiar with the use and integrating technology in their classes, however, redesigning the teaching-learning process is a challenge to keep them abreast with the 21<sup>st</sup> century education.

### Challenges

The second group of results is a portrait of the actual perception with a composite index of the degree on challenges caused by the implementation of change in the education system, as measured by adding the answer choice “growing challenge” to “already a major challenge” as found in Table 2.

**Table 2: Challenges to the New Education Visions (n=48)**

Being a Challenge	don't know	not at all	growing	major	ongoing	not familiar
Improving Digital Literacy	0%	0%	54%	46%	100%	0%
Blending Formal and Informal Learning	0%	4%	79%	17%	96%	0%
Scaling Teaching Innovations	0%	2%	63%	33%	96%	2%
Competition from New Models of Education	0%	4%	64%	30%	94%	2%
Advancing Digital Equity	0%	4%	52%	41%	93%	2%
Teaching Complex Thinking	0%	7%	50%	43%	93%	0%
Achievement Gap	0%	9%	53%	38%	91%	0%
Expanding Access	0%	9%	52%	39%	91%	0%
Managing Knowledge Obsolescence	2%	7%	58%	33%	91%	0%
Embracing the Need for Radical Change	0%	11%	53%	36%	89%	0%
Rewarding Teaching	0%	11%	49%	40%	89%	0%
Academics' Attitude about "Technology"	0%	11%	57%	33%	89%	0%
Rethinking the Roles of Educators	0%	13%	62%	26%	87%	0%
Integrating Technology in Faculty Education	0%	13%	40%	47%	87%	0%
Keeping Education Relevant	0%	13%	34%	53%	87%	0%
Balancing Our Connected and Unconnected Live	0%	11%	57%	30%	87%	2%
Insufficient Metrics for Evaluation	0%	13%	47%	38%	85%	2%
Personalizing Learning	2%	13%	61%	24%	85%	0%
Documenting and Supporting New forms of School	0%	11%	57%	28%	85%	4%

In terms of challenges encountered by the respondents, most of the indicators of the Becker et al. (2017) are similar to the results of the study. Educators perceived that challenges are *solvable* with the one hundred percent (100%) improving digital literacy and ninety-six (96%) in integrating formal and informal learning which are seen as the two most growing challenges in higher education. It is important to note more specifically, more than 9 respondents out of 10 perceived as difficult to reduce the achievement gap and to advance digital equity, maybe because it is somehow out of their control.

There is a perception of being *wicked* in managing knowledge obsolescence by ninety-one percent (91%) and rethinking

the roles of educators by eighty-seven percent (87%). These results show that these challenges are present although the most difficult to solve are still on their growing phase, which means they are not yet faced by the respondents.

#### ***Developments in technology for higher education***

The third importance group of results is a portrait of the actual perception with a composite index of the degree on importance of the diverse technologies to be implemented in the education system, as measured by adding the answer choice "growing importance" to "already of major importance" as presented in the Table 3.

**Table 3: Importance of Coming Developments in Technology for Higher Education (n=48)**

Developments in Technology	dont know	not at all	growing	major	ongoing	not familiar
Adaptive Learning Technologies	0%	0%	26%	74%	100%	0%
Mobile Learning	0%	2%	43%	55%	98%	0%
The Internet of Things	0%	2%	36%	60%	96%	2%
Tablet Computing	0%	6%	43%	51%	94%	0%
Natural User Interfaces	0%	2%	47%	47%	94%	4%
Bring Your Own Device	0%	6%	47%	47%	94%	0%
Learning Analytics	0%	2%	20%	74%	93%	4%
MOOC	0%	9%	49%	43%	91%	0%
Games and Gamification	0%	9%	48%	43%	91%	0%
Flipped Classroom	2%	4%	34%	55%	89%	4%
3D Printing	4%	6%	47%	43%	89%	0%
Robotics	0%	11%	47%	43%	89%	0%
Makerspaces	0%	2%	55%	34%	89%	9%
Augmented & Virtual Reality	2%	9%	49%	38%	87%	2%
Next-Generation LMS	2%	6%	38%	47%	85%	6%
Wearable Technology	0%	11%	47%	38%	85%	4%
Quantified Self	6%	2%	49%	36%	85%	6%
Affective Computing	2%	4%	34%	51%	85%	9%
Virtual Assistants	2%	15%	45%	36%	81%	2%
Artificial Intelligence	2%	13%	50%	30%	80%	4%

From this table, most of the indicators of the Becker et al. (2017) are similar in terms of the importance at that time, as perceived by the respondents. All of the respondents perceived that in one year or less, adaptive learning technologies is very important in higher education followed by the use of mobile learning where ninety-eight (98%) considered important as coming development of technologies. From two to three years, ninety-six percent (96%) considered the Internet of things important followed by the next generation LMS by eighty-five percent (85%). In the four to five years, eighty percent (80%) of the educators considered artificial intelligence important with ninety-four percent (94%)

of them considered natural user interfaces also important.

The relative importance of the diverse technologies shows that the short term ones in the Becker et al (2017) report are already in place even the Internet of Things is in the priority list but not the new LMS. The need for new functionalities is not perceived while the future of more sophisticated technologies is perceived as less important.

#### **Other Analysis**

The respondents also answered few questions about their involvement with technology. Table 4 presents the results.

**Table 4: Involvement with Technology (n=48)**

Involvement with Technology	Valid	pct/n
I don't like to use technology for teaching	0	0%
I use technology when it can be helpful	27	56%
I like experimenting new approaches permitted by technology	31	65%
We should have more technology available in the classroom	33	69%
I find easily all the support needed to use technology in class	22	46%

Respondents unanimously rejected the statement that they don't like technology and a majority seems to have a very positive view of technology introduction or increased use in the classroom.

A composite index was computed for trend (max: 16 questions \* 4 = 64), for challenge (max: 19 questions \* 4 = 76) and developments (max: 20 questions \* 4 = 80). A t-test was computed to compare women and men perceptions. No significant differences were observed for trends and challenges but men were more affirmative of the importance of developments than women ( $t=2.305$ ,  $sig=.027$ ).

### Conclusion

This study aimed at two objectives: first assess how the Philippines are following the tendency, understand the challenges and can develop with new technologies. The data collected from our respondents show that yes indeed they are not left over in this revolution and emergence of a new paradigm for the education, heated by the technology as catalyst of change. Second, it shows that it is possible and useful to translate into a quantitative survey the thought of experts in order to see if their opinion is shared on the field, which in this case revealed to be confluent. But this study suffers from diverse flaws, namely the fact that our sample is a convenient style self-selection, based on a low response rate without the possibility to infer on the general population. The questionnaire itself should be improved before it will be sent to other countries in order to compare Philippines' results with other comparable countries. Further research is needed.

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