EMPIRICAL ANALYSIS OF EDUACTION TECHNOLOGY IN TEACHING - LEARNING ANDEVALUATION

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Abstract.

This study aimed to provide an organised overview of empirical research in the developing subject of educational technology professional development (ETPD) for faculty members. Ensuring the use of technology in the classroom with pedagogical soundness is the main goal of faculty members' ETPD. A comprehensive review of the literature yielded 35 papers. The findings indicated three potential stances that faculty members could use to advance their ETPD: faculty as researcher, faculty as designer, and faculty as learner. By providing empirical evidence, our findings may assist policymakers and stakeholders in understanding the critical indicators of faculty members' ETPD and facilitating a scalable and long-lasting shift in education.

Introduction

Teaching, Learning and Evaluation is one of the most importantcomponents of NAAC Assessment and Accreditation foraffiliated colleges. The performance of the college in the teachingand learning process and in the evaluation of student performanceobjectively, transparently, timely and continuously, will beperceived by the stakeholders to form an opinion on the college ascompared to other colleges. Considering the special importance ofthis criterion in the assessment of the quality of an affiliatedcollege, NAAC gave the highest weightage (350 out of 1000) outof all the seven assessment criteria. The affiliated colleges have toreach effectively all the stakeholders in their respective catchmentareas with all the information related to the college and admissiondetails. They should have a transparent admission processproviding due share to the reservation categories followinginclusive policy.

The diverse needs of the students shall beaddressed strategically to ensure all the students find apersonalized approach in the teaching and learning process. Thefaculty working in the college should be of high quality and

upskill themselves from time to time. They should be empoweredto take suitable decisions to achieve optimum results in theirwork. The teaching and learning methods adopted by the facultyshould reflect the changing needs of the students. Advancedteaching methods such as experiential learning, participativelearning and other self-learning methods shall be used to maketeaching and learning simple and effective. Technologyinterventions should be integrated into the process to prepare thestudents for future-ready. The entire system and processes shallbe student-centric. The evaluation system should be designed insuch a way that it measures the outcomes of the course/programme. There shall be a mechanism to address the grievancesof the students on the evaluation. The satisfaction of the studentsis of vital importance and the colleges should ensure that in all ofits academic and administrative activities.Affiliated colleges should study carefully the key indicators ofquality in this criterion and evolve policies, procedures, practicesand specialactivities to ensure the highest quality in this. Thefollowing are the key indicators of this criterion.

Key indicators of the Criteria:

The key indicators of theteaching, learning and evaluation are; (1) student enrolment andprofile, (2) Student –Teacher Ratio, (3) teaching-learning process,(4) teacher profile and quality, (5) evaluation process andreforms, (6) student performance and learning outcomes, (7)student satisfaction and survey.

Key Indicators (KIs)	Affiliated/ Constituent Colleges
2.1 Student Enrolment and Profile	40
2.2 Student Teacher Ratio	40
2.3 Teaching-Learning Process	40
2.4 Teacher Profile and Quality	40
2.5 Evaluation Process and Reforms	40
2.6 Student Performance and Learning Outcomes	90
2.7 Student Satisfaction Survey	60
Total	**350**

The following paragraphs describe the importance of eachof the key indicators:

a. **Student Enrolment and Profile:** The process ofadmitting students to the programmes is through atransparent, well-administered mechanism, complying

with all the norms of the concerned regulatory/governingagencies including state and central governments. Apartfrom the compliance to the various regulations, theinstitution put forth its efforts in ensuring equity and wideaccess havingrepresentation of student community fromdifferent geographical areas and socio-economic, culturaland educational backgrounds. These will be reflected inthe student profile. It is desirable to have students fromdiverse segments be it gender, region, social class, otherstates, international students, etc., to reflect holistic andinclusive student population learning and understandingmany similarities and differences among themselves.

b. **Student Teacher Ratio**: The new National EducationPolicy (NEP 2020) calls for significant transformations inall sectors of education. It proposes several changes in thecurrent system aimed at ensuring the provision of qualityteachers and quality teaching in order to secure qualityeducation for all. The policy acknowledges teachers

as theheart of the learning process, and stresses the importanceof their recruitment, continuing professional development,work environment and service conditions The policy takesa systems view of teaching quality, linking it to the status

of the profession, the quality of those entering into it,quality of initial professional development, careermanagement and work-place environment including thephysical environment, accountability and leadership," thereport states. Some of the key recommendations of NEP2020 directly addresses solutions the report mentions.

Like the extensive use of technology to improve teaching,learning, educational planning and management; a lightbut tight regulatory framework to ensure integrity,

transparency and effective resource management, and toencourage efficiency of the educational system,innovation and out-of-the-box ideas; research for thesector; and continuous review of progress based onsustained research and assessment.The Student Teacher Ratio (STR) is closely related toquality of teaching, learning and evaluation process. TheStudent-teacher ratio should be optimal to enable teachers

to pay individual attention to students to analyze theirinterests and competence, their learning process, theoutcomes and also contribute significantly for student

achievements.

c. **Teaching-Learning Process:** Diversity of learners inrespect of their background, abilities and other personalattributes will influence the extent of their learning. The

teaching-learning modalities of the institution are renderedto be relevant for the learner group. The learner-centerededucation through appropriate methodologies such

asparticipative learning, experiential learning andcollaborative learning modes, facilitates effective learning.Teachers provide a variety of learning experiences,including individual and collaborative learning. Interactiveand participatory approaches, if employed, create a feelingof responsibility in learners and make learning a processof construction of knowledge. Of late, digital resources forlearning have become available and this makes learningmore individualized, creative anddynamic.

d. **Teacher Profile and Quality:** "Teacher quality" is acomposite term to indicate the quality of teachers in termsof their qualification, teacher characteristics, adequacy ofrecruitment procedures, faculty availability, professionaldevelopment andrecognition of teaching abilities.Teachers take the initiative to learn and keep abreastwiththe latest developments, innovate, continuously seekimprovement in their work, and strive for individual andinstitutional excellence. Acquiring research degrees is

highly desirable. Updating knowledge by participating intraining programmes,conferences, workshops andseminars, improving educational qualifications in relevantareas particularly in digital skills and 21st-century skillsare important indicators of Teacher quality.

e. **Evaluation Process and Reforms:** This Key Indicatorlooks at issues related to the assessment of teaching,learning and evaluative processes and reforms, to increase

the efficiency and effectiveness of the system. One of thepurposes of evaluation is to provide development-inducingfeedback. The qualitative dimension of evaluation is in itsuse for enhancing the competence of students. Theinnovative evaluation process is to gauge the knowledgeand skills acquired at various levels of the programmes.The

quality of the assessment process in an HEI dependson how well the examination system actually tests theProgramme outcomes (POs) and Course Outcomes (Cos),

quality of questions, the extent of transparency in thesystem, the extent of development inducing feedbacksystem, regularity in the conduct of examinations and

declaration of results as well as the regulatory mechanismsfor prompt action onpossible errors.

f. **Student Performance and Learning Outcomes:** Thereal test of the extent to which teaching-learning has beeneffective in an HEI is reflected in student performances.Student performance shall be analysed in terms of therealization of learning outcomes which are specificationsof what a student should be capable of doing on successfulcompletion of a course and/or a programme. This is thereason for allocating high weightage points to this keyindicator in this criteria. The institutions are expected todesign an assessment system capable of monitoring theprogress of the student in each of the listed outcomes byadopting varied methods and different timelines.

g. Student Satisfaction Survey: All the efforts of teachersand the institution to make learning a meaningful processcan be considered impactful only to the extent studentsperceive it to be meaningful. Their satisfaction level isdecided by the kinds of experiences they undergo, theextent of the “comfort” feeling as well as intellectual

stimulation the learning situations provide. Their feedbacksignificantly showcases the actual quality of teachinglearningprocess enabling identification of the strengths of

teaching as well as the possible improvements. Studentsatisfaction, thus, is a direct indicator of the effectivenessof teaching-learning in the institution. It may

beimpractical to capture this aspect from every student;however, every HEI can resort to a sample survey on aformalized basis to capture this significant feature. This is

the reason the revised assessment framework of NAACadopts a survey of student satisfaction.

Evaluation Process and Reforms: (Weightage 40)

The issues related to assessment of teaching, learning andevaluative processes and reforms, to increase the efficiency andeffectiveness of the system are of paramount importance forhigher education institution. One of the purposes of evaluation is

to provide development-inducing feedback. Further it should alsohelp the teacher to plan appropriate activities for enhancingstudent performance. The qualitative dimension of evaluation isin its use for enhancing the competence of students. Innovativeevaluation process is intended to gauge the knowledge and skills

acquired at various levels of the programmes. The majorevaluation reforms defined by the university that are adopted bythe institutions, and the reforms initiated by the institution's on itsown, details on some of the formative and summative evaluation

approaches adopted to measure student achievement which havepositively impacted the system, details on the significantimprovements made in ensuring rigor andtransparency in theinternal assessment and weightages assigned, for the overalldevelopment of students should be rigorously considered.The continuous evaluation during the semester period is a keyaspect in the evaluation of the student. This mechanism allows forincremental feedback to identify problems at their earliest stages.Continuous assessment provides students with a constant streamof opportunities to prove their mastery and sends the message thateveryone can succeed if given enough time and practice. Thisreduces the anxiety around testing and

heightens the emphasis onthe learning itself. The advanced students can progress through.

DEFINITIONS AND PRELIMINARIES USED IN THIS PAPER:

1. Formulla:

$\mathbf{C_O} = \frac{AE + AI}{W} \times \mathrm{SF}$ and $\mathbf{P_O}$ = Average of course out comes

Where AE: (Average of external marks)

AI: (Average of internal marks)

SF : (Syllabus completion factor)

W: (Weight age of marks)

Terms and conditions for defining (CO' s) course out comes :

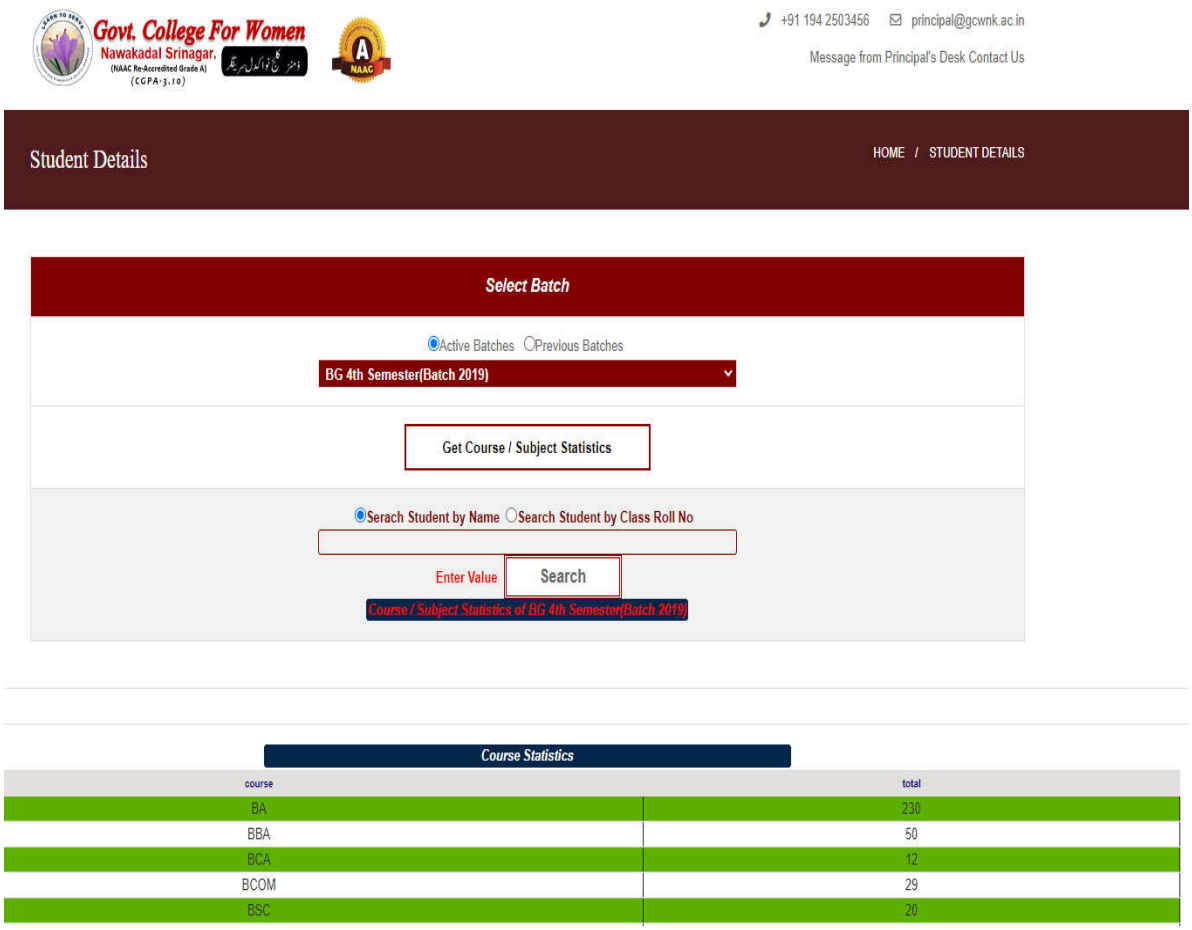
1. IF C_O>70, then highest level of course is attained denoted by L_3.
2. IF $50 < C_O$<70 , then moderate level of course is attained denoted by L_2.
3. IF $35 < C_O$<50 ,then average level of course is attained denoted by L_1.
4. IF $C_O < 35$, then poor level of course is attained denoted by L_0.

Terms and conditions for defining (PO's) Programme outcomes :

1. IF $80 < P_O$<100, then highest level of programme is attained denoted by grade A.
2. IF $60 < P_O$< 80 , then moderate level of programme is attained denoted by grade B.
3. IF $40 < P_O$<60 ,then average level of programme is attained denoted by grade C.
4. IF P_O<40, then poor level of programme is attained denoted by grade D.

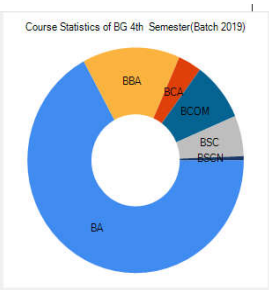
2. Main Results:

In this Section of the paper, we will calculate OBL , CO' ^{s} and PO'^{s} of the date which we collect from [4]



Course Statistics

course	total
BA	230
BBA	50
BCA	12
BCOM	29
BSC	20



Subject Statistics

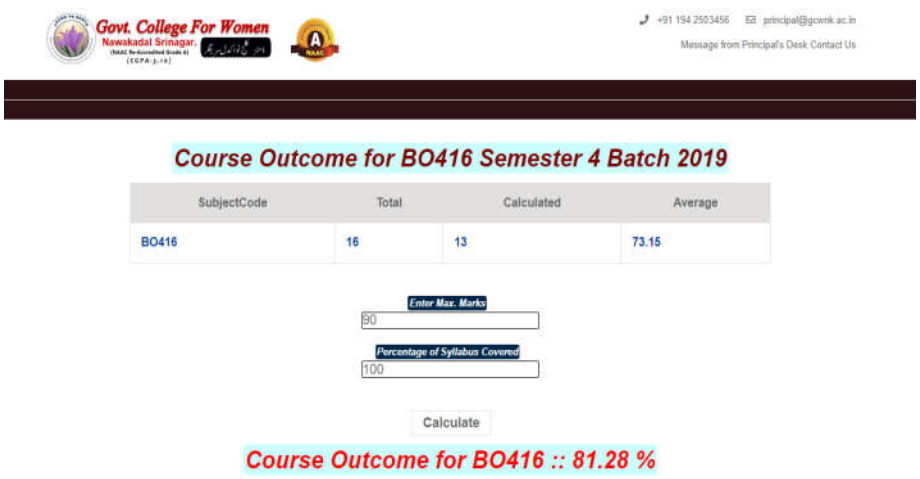
Subject Name	Subject Code	Total	View All	Course Outcome
DEVELOPING EMOTIONAL COMPETENCE(2017)	(DEC418)	30	View All	Course Outcome
DISASTER MANAGEMENT	(DM418)	113	View All	Course Outcome
EARLY CHILDHOOD CARE AND EDUCATION	(ECC418)	167	View All	Course Outcome
GENDER SENSITIZATION (2017)	(GDS418)	10	View All	Course Outcome
LEARNING SKILLS OF AFSANA IN URDU (2017)	(LAU418)	23	View All	Course Outcome
ARABIC LITERATURE	ARL416	4	View All	Course Outcome
BIO-CHEMISTRY	BC416	1	View All	Course Outcome
BOTANY	BO416	17	View All	Course Outcome
BUSINESS RESEARCH	BRH417	50	View All	Course Outcome
BIOTECHNOLOGY	BT416	5	View All	Course Outcome
COMPUTER APPLICATIONS	CA416	3	View All	Course Outcome
CHEMISTRY	CH416	16	View All	Course Outcome
CORPORATE ACCOUNTING	CPA417	29	View All	Course Outcome
Cost Accounting	CSA416	29	View All	Course Outcome
DESIGN AND ANALYSIS OF ALGORITHMS	DAA417	12	View All	Course Outcome
DATABASE MANAGEMENT	DBM417	12	View All	Course Outcome
ECONOMICS	EC416	4	View All	Course Outcome
ENGLISH LITERATURE	EL416	4	View All	Course Outcome
ENGLISH II	ENG419	22	View All	Course Outcome
GEOGRAPHY	GG416	9	View All	Course Outcome

FINANCIAL MANAGEMENT	FMG417	50	View All	Course Outcome
GENERAL ENGLISH	GE419	258	View All	Course Outcome
HUMAN RESOURCE MANAGEMENT	HRM417	50	View All	Course Outcome
HOME SCIENCE	HSC416	10	View All	Course Outcome
INDIAN MUSIC	IM416	10	View All	Course Outcome
KASHMIRI LITERATURE	KRL416	1	View All	Course Outcome
MATHEMATICS	MM416	2	View All	Course Outcome
PHYSICS	PH416	2	View All	Course Outcome
PRODUCTION AND OPERATIONS MANAGEMENT	POM417	50	View All	Course Outcome
PERSIAN LITERATURE	PRL416	3	View All	Course Outcome
POLITICAL SCIENCE	PS416	13	View All	Course Outcome
PSYCHOLOGY	PSY416	34	View All	Course Outcome
SOCIOLOGY	SO416	142	View All	Course Outcome
STATISTICS	ST416	3	View All	Course Outcome
STATISTICS	ST417	12	View All	Course Outcome
SOFTWARE ENGINEERING	SWE417	12	View All	Course Outcome
TOURISM AND TRAVEL MANAGEMENT	TTM416	2	View All	Course Outcome
URDU LITERATURE	URL416	12	View All	Course Outcome
ZOOLOGY	ZO416	20	View All	Course Outcome

Subject Statistics of BG 4th Semester(Batch 2019)

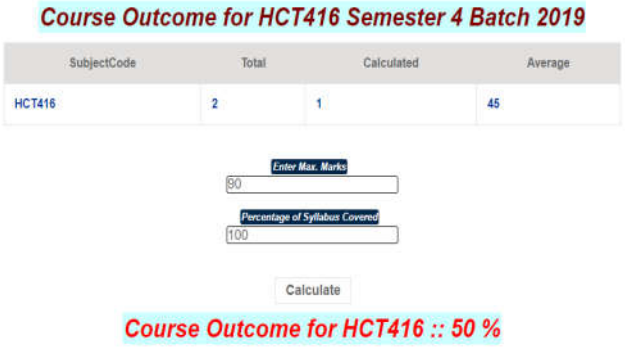
Course out come for 4th semester (batch -2019) for some specific subjects is as follow:

1. course outcome for BO416



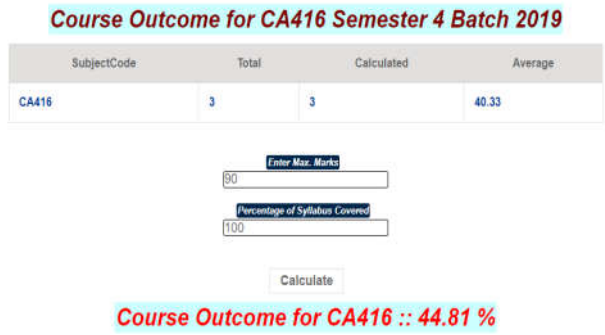
Here course outcome for BO416 is 81.28%, that is C_O>70, then highest level of course is attained L_3.

2. course outcome for HCT416



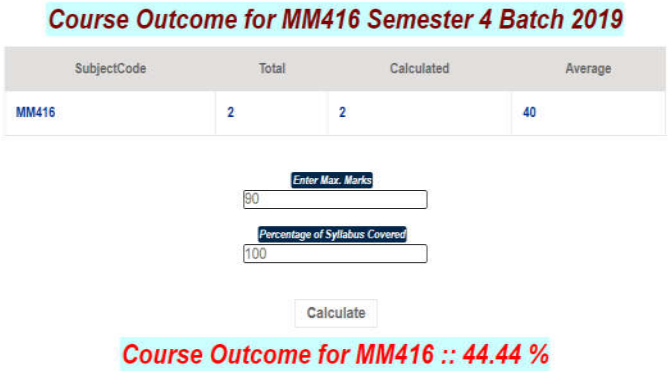
Here course outcome for HCT416 is 50%, that is $C_O < 70$, then moderate level of course is attained L_2

3. course outcome for CA416



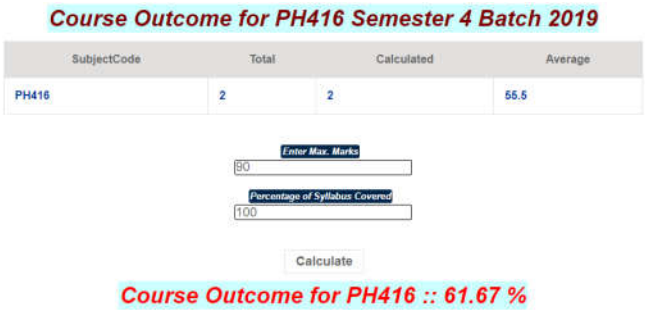
Here course outcome for CA416 is 44.81%, that is C_O <50, then moderate level of course is attained L_1.

4. course outcome for MM416



Here course outcome for MM416 is 44.44%, that is C_O <50, then average level of course is attained L_1.

5. course outcome for PH416



Here course outcome for PH416 is 61.67%, that is C_O >50, then moderate level of course is attained L_2.

CONCLUSION:

Conducting this literature review has given us the opportunity to explore ETPD in higher education through a diversity of methodologies and theories, navigating through several educational contexts in different areas of the world since 2002. Following our immersion in this emerging field of research, we conclude by attempting to illuminate some key insights and suggest some prospects for future inquiry. A first glance at our literature review demonstrates that AngloSaxon countries prevail (see Table 1), which may be explained by the bias toward English language publications. However, the Netherlands has stood out since the beginning of this emerging research field. In fact, in common with Anglo-Saxon countries, the Netherlands has implemented early national policies, which have brought up faculty ETPD in research agendas earlier than elsewhere. As noted by Drent and Meelissen

(2008), “since the mid-1990’s, the Dutch government has provided teacher education institutes with special facilities to play a pioneering role in the integration of ICT in education” (p. 187). The same facilitating national educational context can be found in the USA where the Department of Education initiated the Preparing Tomorrow’s Teachers to Use Technology program in 1999. In Australia, Romeo et al. (2012) indicated that the Australian National Teaching Teachers for the Future program has engendered research opportunities based on its purpose to build the ICT education capacity of the next generation of teachers. These “pioneer” countries first investigated the field at the individual scale (Dolk et al., 2002), then at the one-toone (Matthew et al., 2002) and community scales (Maor, 2006). They were followed by “newcomer” countries including Spain (García and Roblin, 2008), Canada (Shattuck and Anderson, 2013), South Africa (Esterhuizen et al., 2013), Kenya (Foley and Masingila, 2014), Turkey (Baran, 2016), Israël (Baya’a and Daher, 2015), United Arab Emirates (Psiropoulos et al., 2016), Belgium (Becuwe et al., 2017), Greece (Psycharis and Kalogeria, 2017), and Taïwan (Chen et al., 2018). These countries offered the opportunity to extend our knowledge in this field of research to different geographical and cultural areas and, therefore, to different educational contexts. From a theoretical perspective, the first works in the field were based on technology, and a major trend toward innovation-based theoretical frameworks then took the lead in all pioneer countries. Finally, beginning in 2013, we noticed an increasing number of international collaborations to investigate faculty ETPD. For example, authors from three different countries (USA, Netherlands, and Belgium) collaborated in Becuwe et al. (2017) study. Conducting this literature review has allowed us to follow the emergence and worldwide spread of an emerging field of research demonstrating that a wide range of theoretical and methodological approaches have been adopted.

Whatever theoretical approaches researchers adopted in this field of knowledge (i.e., technology-based, innovation-based, or socio-cultural interactions-based), they share the same vision of a sustainable and scalable educational change, enabling faculty members to achieve the new educational requirements of the twenty-first century. Niederhauser et al. (2018) defined sustainability and scalability, respectively, as "a persistent and ongoing change of the educational culture" (p. 509) and as "the likelihood that an innovation will diffuse effectively across a culture/context" (p. 511). This review may help inform stakeholders and policy makers to promote a sustainable and scalable educational change by highlighting key markers of faculty ETPD from empirical evidence. The need to reframe faculty members' pedagogies toward a more student-centered constructivist approach is one of the key markers (e.g., Ashton and Newman, 2006; Rienties et al., 2013), echoing what we know about the impact on teachers' pedagogy of technology integration in the classroom (Fishman and Dede, 2016). According to these authors, educational technology should encourage us to rethink the teaching and learning process as a whole and lead beyond what is achievable without it. Therefore, a strong and authentic feeling of transformation in faculty's own practice is considered a valuable criterion of success for ETPD programs (García and Roblin, 2008). Some authors have also highlighted changed attitudes toward ICT (King and Boyatt, 2014; Baya'a and Daher, 2015), a shift of beliefs and perceptions (Psiropoulos et al., 2016), changed roles in the classroom (Esterhuizen et al., 2013), or improved knowledge and competencies in technology-enhanced teaching (Jaipal-Jamani et al., 2018). Another key marker of faculty ETPD is the redesign of the course curriculum (e.g., Matthew et al., 2002). As faculty members become involved in ETPD programs, authors have observed that (1) new resources have been created such as portfolios or videos (Ashton and Newman,

2006; Christ et al., 2017), (2) the number of webbased learning environments, courses on Moodle, and ICT pedagogical initiatives has increased (Baya'a and Daher, 2015), or (3) a wider variety of ways to integrate technology inteaching have been used (Matthew et al., 2002). Finally, perceived impacts on students emerged sparingly as a key marker in our literature review (Archambault et al., 2010; Derting et al., 2016). This is surprising because students' success should be the

ultimate goal of faculty members' ETPD. Therefore, perceived impacts on students should be used as a basic outcome to improve faculty professional development. Derting et al. (2016) raised the lack of objective measures of student learning and skills. As we conclude and reflect on this journey in an emerging field of research, we realize that while, on the one hand, we have gained much knowledge about ETPD in higher education,

much uncertainty remains. For example, we do not know (1) if faculty members' postures should be adopted simultaneously or through a developmental process, (2) if these different postures independently affect key markers of ETPD or target specific ones,

or (3) if future research in this field should reach a consensus regarding which theoretical and methodological approach should be adopted in order to build an inclusive framework to study ETPD in higher education within a variety of diverse educational

contexts. We suggest design-based implementation research (Fishman and Dede, 2016) to be this inclusive framework as it will help (1) understand faculty members ETPD beyond the three separate main postures we identified, (2) consider sustainability and scalability as key issues from the beginning of the design process,

and (3) focus at the level of schools or school systems as opposed to at the level of a single classroom or group

of classrooms. Finally, conducting a systematic literature review in ETPD in higher education brings out some limitations related to an emerging field of research including potential number of papers that may be included, diversity of research investigations, and dealing with a rapidly changing technology world that impacts

research inquiries. However, this attempt to synthetize in a meaningful way research in ETPD in higher education may offer to the research community the opportunity to build their investigations on what we already know in this emerging field of research in order to explore what remains to be discovered.

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