

Toward a framework for strengthening participants' self-efficacy in online education

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Self-efficacy in
online
education

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Abstract

Purpose – The purpose of this study was to review the role of self-efficacy in online education with an objective to propose a holistic framework for strengthening participants' self-efficacy, especially in the Asian context.

Design/methodology/approach – To investigate the potential role of self-efficacy of the participants of online academic activities, this study followed the conceptual analysis method, which is breaking down concepts into constituent elements to get a superior understanding of a particular philosophy.

Findings – The findings revealed that self-efficacy, the level of confidence someone has to perform a particular task, is an important factor among teachers and students operating online platforms, and enhanced efficacy is capable of encouraging online practices. Finally, the study proposed a framework to strengthen self-efficacy among participants with intervention measures to make online education effective and impressive.

Research limitations/implications – The proposed framework will help stakeholders of online education to improve their efficacy and leverage the potential of online education to the fullest. Millions of first-generation online users in many Asian countries who possess low self-confidence in their ability might find the framework easier for better integration, interaction and collaboration in the online learning environment.

Originality/value – A vast literature survey was made before proposing this framework that could open up a new dimension in online education by scaffolding participants' inner thrust.

Keywords Self-efficacy, Online education, Framework for online education, Asian practitioners

Paper type Research paper

Introduction

Mahatma Gandhi, the great Asian thinker, said a person often becomes what he believes himself to be, meaning if he keeps on believing that he cannot do a certain thing, he will never succeed; reversely if he keeps on believing that he can do it, he will surely acquire the capacity to do it even if he may not have it at the beginning (Deats, 2005). This "self-belief" which was later extensively researched as "self-efficacy" by Albert Bandura in his "social cognitive theory" refers to beliefs in one's capabilities to organize and implement the courses of action needed to produce given accomplishment and having exclusive power to predict one's behavior (Bandura, 1997, p. 3). Self-efficacy determines and controls people's thoughts and the ways they act or behave (Alqurashi, 2016). Peterson and Arnn (2005) said self-efficacy is the basis of human performance, and it is significant to examine the factors that affect self-efficacy along with the desired behaviors. Self-efficacy beliefs find answer for the question: Can I do this? Hodges (2008) further finds this is situation specific, and individuals may find self-efficacy belief varying from situation to situation.

In an educational setting, understanding self-efficacy with respect to various academic practices is significant because it has a deep impact on the aims, effort and achievement of the



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participants. A lot of past studies have examined the importance of participants' self-efficacy with respect to their use of online education strongly suggests a link between self-efficacy and technology use potential (Sun and Chen, 2016; Corry and Stella, 2018). Honicke and Broadbent (2016) said using an online platform for education makes sense because today's students are digital natives, and the majority of these students are well adept at using technology that a learner's academic self-efficacy is bravely associated with academic performance. Different from conventional face-to-face classroom lecturing, technology-enhanced learning not only facilitates the showcasing of multimedia teaching materials but also encourages students to take initiatives to research on their own and to share with peers about their personal insights into online forums (Tsai, 2017). Thus, the construct of self-efficacy sounds like a recipe for academic success so far as online education is concerned. Hence, in this literature review the role of self-efficacy in online education, especially in the Asian context, was studied. In total, three main areas of research were identified for this review: (1) role of self-efficacy in online education, especially in the Asian context, (2) factors influencing self-efficacy in online education and (3) a framework for strengthening participants' self-efficacy in online education.

Self-efficacy

Bandura (1997) found self-efficacy to be important because people with high self-efficacy are more likely to make an effort to change their work environment and persist at their work when facing negative outcome expectations. Conversely, people with low self-efficacy are more likely to have feelings of hopelessness and despondency and less likely to persist in similar situations. The stronger their notion of self-efficacy, the better their effort, perseverance, resilience and elasticity (Bandura, 2001), meaning a strong notion of self-efficacy creates feelings of tranquility and provides power to challenge at the face of difficult tasks. It, in all forms, influences our thoughts, emotions, actions, motivation and operates mainly through the cognitive and affective channels and plays a crucial role in shaping our perception of life experiences (Chowdhury, 2020). The summed up effects of having strong self-efficacy can be framed in the following manner, as presented in Figure 1 below.

The perceived self-efficacy determines not only the level of effort but also its quality, i.e. how productively that effort is deployed. Therefore, higher perceived self-efficacy brings about various motivated efforts, and it enables individuals to enhance performances (Talsma *et al.*, 2018). In this context, Bandura (2001) said self-efficacy theory is a common theme in relation to motivation, mostly as a result of its power to predict one's behavior. He suggested that the interplay of environmental factors with people having low or high self-efficacy predicts four variables: success, depression, apathy, effort maximizing (Bandura, 1997). They can be interpreted with the help of the following diagram (see Figure 2).

Bandura's (1997) introduction of self-efficacy theory contained the proposition that self-efficacy perceptions depends on environmental, cognitive and behavioral effects that a person experiences in his/her everyday life. Based on this observation, he said that self-efficacy is derived from four major sources: performance accomplishments, verbal persuasion, vicarious experience and physiological-affective states (see Figure 3). These four areas are accepted as the core elements in the development of self-efficacy and by the interplay of these factors that grow significant belief or disbelief in human in general.

Self-efficacy in the academic context

Bandura's *social-cognitive theory* (2001) recognizes that human learning is based upon a system of three forces: social, personal and behavioral, each of which influences one another

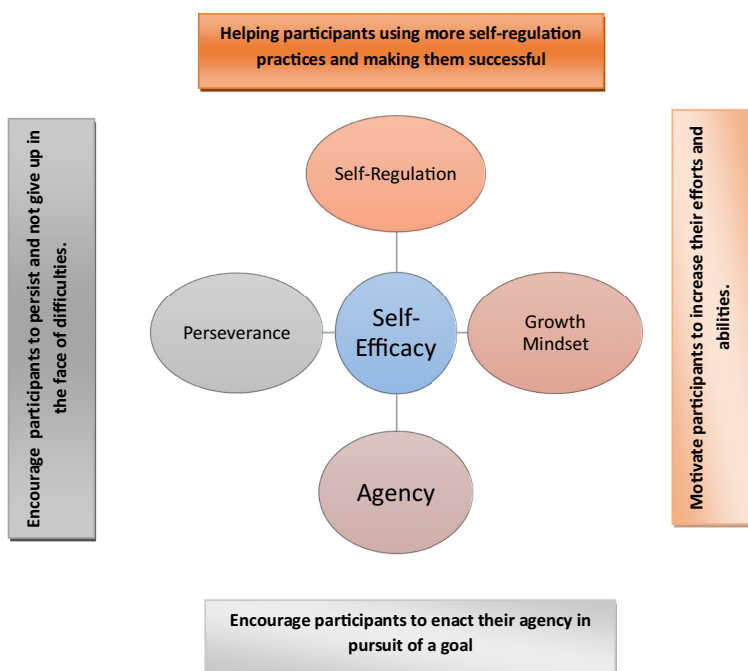


Figure 1.
Effects of having high
self-efficacy

		ENVIRONMENT		S E L F - E F F I C A C Y
		Positive	Negative	
High	Successful	Effort maximization		
Low	Apathy and demotivation	Depression		

Figure 2.
Self-efficacy and
environment interplay

to affect human development as what Woolfolk (2011) said *triarchic reciprocal causality* process. Self-efficacy beliefs, by extension, academic self-efficacy, fall within the personal domain of this process. Honicke and Broadbent (2016) said self-efficacy beliefs influence academic performance of both teachers and students. Students with high self-efficacy have better self-regulation and are more resilient in facing obstacles (Bandura, 2001), demonstrate stronger academic performance and achievement, have increased confidence in their self-regulated learning which affects their engagement and academic achievements thus increases their grades and, eventually, are happier all around (LaRocca, 2017). On the other hand, teachers' with high self-efficacy are more capable in orchestrating

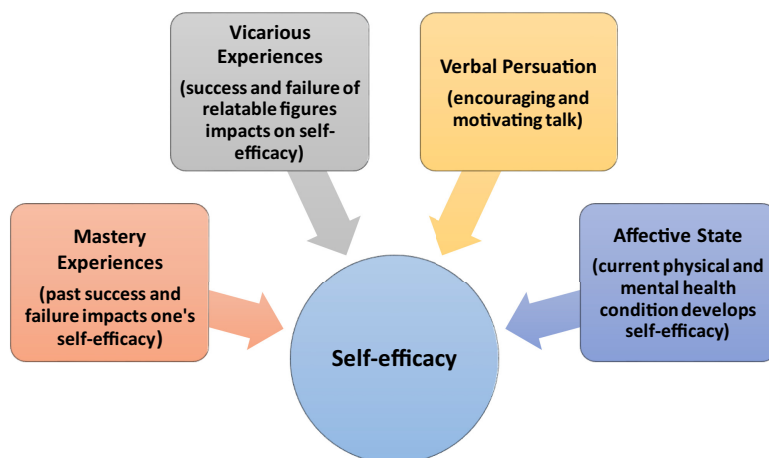


Figure 3.
Principle sources of
self-efficacy (cited in
[Bandura, 1997](#))

teaching–learning activities to bring about “desired changes on student engagement and learning” ([Tschannen-Mora et al., 1998](#), p. 783). This makes the teacher “capable of carrying out good teaching” ([Christophersen et al., 2016](#), p. 241), provides job satisfaction and professional commitment ([Joo et al., 2013](#)), diminishes attrition ([Pellas, 2014](#)) and even influences his/her attitudes for successful integration of technology ([Hatlevik and Hatlevik, 2018](#)).

Purpose of the study

Thus, self-efficacy, the intrinsic self-belief, has a big role in academic activities, including online education ([Pumptow and Brahm, 2020](#)). [Bandura \(1997\)](#) himself found that because of the swift progress of technological tools, the pedagogical use of technology may require special and ever-evolving types of teacher self-efficacy.

Since the focus of this study was Asia, it needs a brief analysis of online education scenario in Asian countries here. Asia consists of 49 countries, 36 of which had been specifically classified as developing countries based on World Bank Country Classifications ([The World Bank, 2019](#)). During the last ten years, enrollment in education (school level to higher education) in Asia has been observed to increase by over 55% ([Paul Glewwe, 2020](#)). This growth in the population and the demand for education are coupled with the projection that “the 21st century will be the Asian Century which is overdue and inevitable” ([Bandalaria, 2018](#), p. 116). This huge learner explosion is beyond capacity of traditional system to cater their academic needs; hence, online education has been gaining traction. There is a huge developing potentiality of online education in Asian countries during coming decades although it has several big challenges to face like uneven development, high cost of establishing a system, uneven teaching quality, cultural bigotry and unfair practice ([Kundu and Bej, 2020](#)).

The gap regarding online education between Western and Asian countries is obvious; in this context, [Ahmed et al. \(2017, p. 102\)](#) found “Western online education platforms are undoubtedly valuable but they lack our domestic cultural needs and practices.” This cultural difference can be convincingly illustrated by the four-dimensional model of cultural differences (see [Table 1](#)) developed by [Hofstede \(1986\)](#).

Numerous studies that have examined the cultural differences between Western and Eastern educations have provided a consistent picture that describes Eastern education as

group-based and teacher-dominated where the students are not encouraged to question or challenge a teacher's knowledge, centrally organized pedagogical culture with examinations as the essential way to define performance. In Western education, to challenge a teacher or tutor is seen as part of the self-development process as dialogue and interaction are encouraged in the learning process that is more commensurate to the online education (Liu *et al.*, 2010). Besides these cultural barriers, digital inclusion in most of the Asian countries to facilitate online learning is uneven which cannot be rooted out overnight. Accepting these limitations, the current study researched how participants' self-efficacy could help them to continue online education amidst these challenges and how their efficacy level could be strengthened. The specific research questions set for this study were as follows:

- (1) What is the role of self-efficacy in online education, especially in the Asian context?
- (2) What are the factors influencing self-efficacy in online education?
- (3) How to strengthen participants' self-efficacy in online education?

Method

This study followed the method of conceptual analysis to study the potential role of the participants' self-efficacy in online education. Conceptual analysis consists primarily in breaking down or analyzing concepts into their constituent parts, in order to gain knowledge or a better understanding of a particular philosophical issue in which the concept is involved (Beaney, 2003). The method of conceptual analysis wants to approach such a problem by breaking down the principle concepts relating to the problem and observing how they interact.

Data collection

The author used secondary data source for analysis that include past research articles and organizational records (mainly of empirical nature). The articles used for literature survey were selected from the education-specific databases of JSTOR digital library, Web of Science, Eric and SCOPUS. A search criterion was developed to select articles for online education to overcome the nonstandardized nomenclature, as stated by Corry and Stella (2012). The first selection criterion was "online education" or "online learning" published within the last 20 years. The second criteria were "general self-efficacy", "Internet self-efficacy", "computer self-efficacy" and "online self-efficacy". The third criteria were "factors influencing online self-efficacy", "Internet self-efficacy" and "computer self-efficacy". General search produced

Dimensions	Descriptions
Power distance (PD)	The degree to which people accept the unequal distribution of power and wealth in a society. High PD is quite evident in Asian countries, especially in India
Individualism–collectivism	The tendency of members of a society to act as individuals or members of a larger group. This cultural collectivism undoubtedly hampers innovations and individuality in Asian countries
Uncertainty avoidance (UA)	The degree of threat an individual feels while facing an uncertain or unknown situation and unstructured ideas. This high UA is the hallmark of Asian societies, especially in India, and people fears to adapt an exceptional path
Masculinity–Femininity	The degree to which the society prefers distinct gender roles. In Asian countries, gender difference is obvious, and women empowerment is not under process and far below the expected state of equity

Table 1.
Illustration of
Hofstede's four-
dimension culture
model in the Asian
context

1886 articles relating self-efficacy in online academic scenario, which were then limited to 50 empirical articles on the basis of particular search of factors influencing participants' self-efficacy for online education. This is especially true for the Asian context that we have searched for developing a framework, the main focus of this study. Then the abstracts of the selected 50 articles (40 made in Asian context) were closely read. The search strategy is presented in [Figure 4](#).

Data analysis

Document analysis was used to classify the research studies by research area/theme. Document analysis is a social research method and is an important research tool in its own right to give voice and meaning around an assessment topic and is an invaluable part of most schemes of triangulation, the combination of methodologies in the study of the same phenomenon (Bowen, 2009). It involves skimming (superficial examination), reading (thorough examination) and interpretation. Here the researcher as an analyst should determine the relevance of documents to the research problem and purpose. Also, the researcher should ascertain whether the content of the documents fits the conceptual framework of the study. It is necessary, as well, to determine the authenticity, credibility, accuracy and representativeness of the selected documents. This study followed the overall recipe of O'Leary (2014) who outlines an eight-step planning process that should take place in document analysis with few changes.

Results

Details of the document analysis of 50 studies are presented in this section in [Table 2](#) along with their respective outcomes in the context of this study.

Discussion

RQ1. Role of self-efficacy in online education, especially in the Asian context

With regard to the effect of self-efficacy on academic performance in online learning environment, most of the above studies (in [Table 2](#)) found that it has a positive correlation with academic performance. In this context, the remark of Hodges (2008) becomes pertinent that the role of self-efficacy in online environments is only in its infancy that needs more studies. To this note, subsequent researchers studied the role of self-efficacy in online education, and the spotlight of these studies mostly was on the technology factor of self-

Databases: Scopus (556 articles), JSTOR digital library(339), Web of Science (329 articles), and ERIC (662 articles) = Total: 1886 articles

Search terms (Stage 1)	Search terms (Stage 2)	Search terms (Stage 3)
<ul style="list-style-type: none"> • 'online education' • 'online learning' 	<ul style="list-style-type: none"> • 'general self-efficacy' • 'internet self-efficacy' • 'computer self-efficacy' online self-efficacy' 	<ul style="list-style-type: none"> • 'factors influencing online self-efficacy, internet self-efficacy, and computer self-efficacy'
50 articles selected		

Figure 4.
Example of a full-search strategy

No	Author(s)	Study	Outcome
1	Lynch and Dembo (2004)	The Relationship Between Self-Regulation and Online Learning in a Blended Learning Context	Learners' self-efficacy related significantly to their academic performance in blended environment
2	Jashapara and Tai (2006)	Understanding the complexity of human characteristics on e-learning system: an integrated study of dynamic individual differences on user perceptions of ease of use	E-learning system self-efficacy, computer anxiety, personal innovativeness with IT, computer playfulness and computer experience influence perceived ease of use
3	Bates and Khasawneh (2007)	Self-efficacy and college student' perceptions and use of online learning systems	Relationships between self-efficacy, its antecedents, and several online learning outcomes are significant and complex
4	Kitsantas and Chow (2007)	College students' perceived threat and preference for seeking help in traditional, distributed and distance learning environments	Student achievement is significantly correlated with formal help seeking, academic self-efficacy and perceived threat to seek help
5	Lee and Hwang (2007)	The effects of computer self-efficacy and learning management system quality on e-Learner's satisfaction	Learners' satisfaction and self-regulated learning strategy depends on their computer self-efficacy
6	Yukselturk and Bulut (2007)	Predictors for student success in an online course	The effect of the self-regulation variables on students' success was statistically significant and successful students generally used self-regulated learning strategies in the online course
7	Lin <i>et al.</i> (2008)	Building a social and motivational framework for understanding satisfaction in online learning	The students' perceived task value, self efficacy and social ability are very important for satisfaction in online learning
8	Wang and Wu (2008)	The role of feedback and self-efficacy on web-based learning: The social cognitive perspective	Self-efficacy predicted students' use of learning strategies and related to elaborated feedback behavior
9	Hodges (2008)	Self-efficacy, Motivational Email, and Achievement in an Asynchronous Math Course	SELMA among 196 participants was measured and statistically significant relationships were found between SELMA and learners' achievement
10	Chu (2010)	How family support and Internet self-efficacy influence the effects of e-learning among higher aged adults – Analyses of gender and age differences	Emotional family support plays a main role in predicting the effects of e-learning, mediated by general and Internet self-efficacy
11	Chu and Chu (2010)	Multi-level analysis of peer support, Internet self-efficacy and e-learning outcomes – The contextual effects of collectivism and group potency	Internet self-efficacy (ISE) was found having the mediation effects of between peer support and e-learning outcomes
12	Shea and Bidjerano (2010)	Learning presence: Towards a theory of self-efficacy, self-regulation, and the development of a communities of inquiry in online and blended learning environments	A positive relationship exists between learner self-efficacy measures and their ratings of the quality of learning in virtual environments
13	Law <i>et al.</i> (2010)	Learning motivation in e-learning facilitated computer programming courses	A well facilitated e-learning setting can enhance learning motivation and self-efficacy
14	Martin <i>et al.</i> (2010)	Influence Of Learning Management Systems Self-efficacy On E-Learning Performance	Found a significant positive correlation of self-efficacy with course performance for the students in the hybrid online course

(continued)

Table 2.
Summary of research
on self-efficacy in
online education

No	Author(s)	Study	Outcome
15	Song <i>et al.</i> (2011)	Assessing medical students' self-regulation as aptitude in computer based learning	Prior knowledge of online system showed a positive direct effect on online self-efficacy
16	Jashapara and Tai (2011)	Knowledge mobilization through e-learning system: Understanding the mediating roles of Self-Efficacy and Anxiety on perceptions of ease of use	Personal innovativeness with IT showed significant an effect on e-learning system self-efficacy, and computer experience had a significant effect on e-learning system self-efficacy
17	Zhang <i>et al.</i> (2012)	Promoting the intention of students to continue their participation in e-learning systems	Found positive influence of the psychological safety communication climate on self-efficacy
18	So <i>et al.</i> (2012)	Little experience with ICT: are they really the net- generation student-teachers?	Found student teachers who hold constructivist beliefs have strong computer efficacy and show more positive attitudes toward computers in education
19	Shen <i>et al.</i> (2013)	Unpacking online learning experiences: Online learning self-efficacy and learning satisfaction	The number of online courses was a significant predictor of self-efficacy to complete an online course
20	Lin <i>et al.</i> (2013)	Exploring middle-aged and older adults' sources of Internet self-efficacy: A case study	Found five sources underlying middle aged and older adults' Internet self-efficacy as, (1) successful performance accomplishments, (2) vicarious admirable modeling by children, friends and neighbors, (3) verbal or social persuasion by influential friends and family, (4) fear, bad memory, slow reactions, or a joyful state and (5) a proactive personality
21	Putwain <i>et al.</i> (2013)	Academic self-efficacy in study-related skills and behaviors: Relations with learning-related emotions and academic success	Academic self-efficacy, when operationalized as mastery over domain-specific knowledge, has been found to be a predictor of academic achievement and emotions
22	Wang <i>et al.</i> (2013)	Student' characteristics, self-regulated learning, technology self-efficacy, and course outcomes in online learning	Motivation directly influenced the levels of technology self-efficacy, and it was the mediator between the learning strategies and technology self-efficacy
23	Joo <i>et al.</i> (2013)	Locus of control, self-efficacy, and task value as predictors of learning outcome in an online university context	Locus of control, self-efficacy and task value were significant predictors of learner online learning satisfaction
24	Cho and Shen (2013)	Self-regulation in online learning	Found the importance of individual students' intrinsic goal orientation and academic self-efficacy in academic achievement
25	Chiu and Tsai (2014)	The roles of social factor and Internet self-efficacy in nurses' web-based continuing learning	Found that the social factors had positive effects on basic Internet self-efficacy and advanced Internet self-efficacy
26	Pellas, N. (2014)	The influence of computer self-efficacy, meta-cognitive self-regulation and self-esteem on student engagement in online learning programs: Evidence from the virtual world of Second Life	Computer self-efficacy, meta-cognitive self-regulation and self-concept in online courses were not only positively correlated with student's cognitive and emotional engagement factors but were also negatively correlated with behavioral factors

Table 2.

(continued)

No	Author(s)	Study	Outcome
27	Tang <i>et al.</i> (2014)	Blog learning: effects of users' usefulness and efficiency toward continuance intention	Proposed an extended expectation–confirmation model (ECM) that explicitly incorporates experiential learning, perceived self-efficacy and perceived usefulness to examine blog continuance learning behavioral intentions done online
28	Komarraju and Dial (2014)	Academic identity, self-efficacy, and self-esteem predict self-determined motivation and goals	Found that socially oriented students have lower academic self-efficacy, lower self-determined motivation and a preference for performance goals; reversely studiously oriented students report higher self-esteem and a preference for learning goals
29	Kuo <i>et al.</i> (2014)	Interaction, Internet self-efficacy, and self-regulated learning as predictors of student satisfaction in online education courses	Found learners' self-efficacy and ability of Internet use have positive correlation
30	Taipjutorus (2014)	The relationship between learner control and online learning self-efficacy: a thesis presented in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Education at Massey University, Manawatu campus, New Zealand	The study found that computer skills are good predictors of computer self-efficacy
31	Jan (2015)	Academic self-efficacy, computer self-efficacy, prior experience, and satisfaction with online learning	Found academic self-efficacy (ASE) to be most predictive of satisfaction with online learning. Females had a higher mean ASE than males
32	Wang <i>et al.</i> (2015)	Understanding the continuance use of social network sites: a computer self-efficacy perspective	Found that general computer self-efficacy (CSE) affects continuance intention through both cognition and affection, specific CSE mainly affects continuance intention through cognition
33	Lin <i>et al.</i> (2015)	Revalidate forms of presence in training effectiveness: Mediating effect of Self-Efficacy	Found social presence was a stronger predictor of self-efficacy. Self-efficacy is a full mediator between social presence and cognitive presence
34	Shen (2015)	An Empirical Study on Influencing Factors of Knowledge Sharing in Virtual Learning Community	Found that the trust between members had a significant positive effect on self-efficacy of knowledge-sharing. Effect of perceptual learning on self-efficacy of knowledge-sharing was significant
35	Lim <i>et al.</i> (2016)	Structural relationships of environments, Individuals, and learning outcomes in Korean online university settings	The study showed that learner-learner interaction and system quality was related to learner computer self-efficacy. Content quality also significantly predicted computer self-efficacy
36	Liou <i>et al.</i> (2016)	The study of the Antecedents of Knowledge sharing behavior: The empirical study of Yamol online test community	Anticipated extrinsic rewards had a significant and positive effect on knowledge sharing self-efficacy. The knowledge sharing self-efficacy partially mediated knowledge sharing behavior

*(continued)***Table 2.**

No	Author(s)	Study	Outcome
37	Prior <i>et al.</i> (2016)	Attitude, digital literacy and self-efficacy: Flow-on effects for online learning behavior	Found attitude and digital literacy were significantly correlated with self-efficacy. Self-efficacy had a significant positive effect on Peer engagement, Learning-management system interactions, and Convener interaction
38	Reychav <i>et al.</i> (2016)	Leveraging social networks in the adoption of mobile technologies for collaboration	Found network reciprocity had a strong and significant effect on computer self-efficacy. Perceived enjoyment had a positive effect on computer self-efficacy
39	Vayre and Vonthron (2016)	Psychological engagement of students in distance and online learning: Effects of self-efficacy and psychosocial processes	Found community played a significant and positive role on self-efficacy. Academic self-efficacy partially mediated between the sense of belonging to the learning community and enthusiasm
40	Cho and Cho (2017)	Self-regulation in three types of online interaction: a scale development	Found self-regulation in interaction between student and content, student and student, and student and teacher, significantly correlated with self-efficacy, respectively
41	Kim and Park (2017)	Effect of personal factors to use ICTs on e-learning adoption: comparison between learner and instructor in developing countries	Found personal innovativeness in the domain of ICT identified as an important factor influencing computer self-efficacy for instructors. Computer experience was significantly associated with computer self-efficacy for instructors and for learners
42	Hong <i>et al.</i> (2017)	Intrinsic motivation of Chinese learning in predicting online learning self-efficacy and flow experience relevant to students' learning progress	Found that four constructs, namely intrinsic motivation, online learning self-efficacy, flow experience, and learning progress, were all positively correlated
43	Hong <i>et al.</i> (2017)	Intrinsic motivation of Chinese learning in predicting online learning self-efficacy and flow experience relevant to students' learning progress	The study established mathematically that the relationship between Chinese learning intrinsic motivation and online learning self-efficacy was supported with a path coefficient of 0.382 ($t = 4.35$, $p < 0.001$)
44	Hatlevik (2017)	Examining the Relationship between Teachers' Self-Efficacy, their Digital Competence, Strategies to Evaluate Information, and use of ICT at School	Self-efficacy in teaching as a key issue for carrying out good teaching practice and also found a positive relationship between teachers' self-efficacy in information and communication technologies (ICTs)
45	LaRocca (2017)	Self-efficacy toolkit	Found students with high levels of self-efficacy participate more in class, work harder, persist longer, and have fewer adverse emotional reactions when encountering difficulties than students with lower self-efficacy
46	Gerick <i>et al.</i> (2017)	School-level predictors for the use of ICT in schools and students' CIL in international comparison	Use of ICT by teaching staff in schools and their teaching-efficacy differs among different education systems

Table 2.

(continued)

Table 2.

No	Author(s)	Study	Outcome
47	Cussó-Calabuig et al. (2018)	Effects of intensive use of computers in secondary school on gender differences in attitudes toward ICT: a systematic review	Despite the intensive use of computers, boys are favored in computer anxiety, self-confidence and self-efficacy and suggest no differences in computer enjoyment
48	Yokoyama (2019)	Academic Self-Efficacy and Academic Performance in Online Learning: A Mini Review	Study found academic self-efficacy (ASE) tended to correlate with academic performance in online learning environment, similar to a general learning environment
49	Kundu et al. (2020)	An empirical study on the correlation between teacher efficacy and ICT infrastructure	Indian school teachers' self-efficacy has the potential to work amidst poor infrastructural set up, and it has a positive correlation with their perception of ICT infrastructure
50	Pumptow and Brahm (2020)	Students' Digital Media Self-Efficacy and Its Importance for Higher Education Institutions: Development and Validation of a Survey Instrument	Extended Bandura's social cognitive theory (SCT) toward digital media usage in the context of higher education and found that academic self-efficacy and digital media self-efficacy can be conceptualized as two separate constructs

efficacy in online learning, like computer self-efficacy ([Pellas, 2014](#)), Internet self-efficacy ([Lin et al., 2013](#); [Kuo et al., 2014](#)), digital media self-efficacy ([Pumptow and Brahm, 2020](#)), learning management system (LMS), self-efficacy ([Prior et al., 2016](#); [Martin et al., 2010](#)) and ICT self-efficacy ([Cusso-Calabuig et al., 2018](#); [So et al., 2012](#)). Few studies focused on the role of self-efficacy, task value ([Joo et al., 2013](#)) and academic self-efficacy factors ([Jan, 2015](#); [Cho and Shen, 2013](#); [Yokoyama, 2019](#)), and few others focused on the general self-efficacy ([Gebara, 2010](#)) in online education. Some studies (like [Taipjutorus, 2014](#); [Shen et al., 2013](#)) investigated multi-dimension of self-efficacy in online learning. Few contradictory outcomes are also observed when [Pellas \(2014\)](#) and [Jan \(2015\)](#) found that computer self-efficacy and student satisfaction level have no positive or significant relationship conversely, while [Kuo et al. \(2014\)](#) found that learners' self-efficacy and Internet usage have positive correlation. [Bates and Khasawneh \(2007\)](#) found self-efficacy for online technologies to be a good predictor of student performance in online courses and if the students chose to enroll in an online class, it is expected that their technology self-efficacy toward the class was high. [Reychav et al. \(2016\)](#), [LaRocca \(2017\)](#) and [Cusso-Calabuig et al. \(2018\)](#) found that participants' perceived enjoyment in an online course depends on their computer self-efficacy, the root of success in any online course. [Taipjutorus \(2014\)](#) and [Hatlevik \(2017\)](#) demonstrated a positive relationship between self-efficacy and using technology for teaching purposes. [Loar \(2018\)](#) reported that computer self-efficacy in basic and advanced ICT operational and collaborative skills and self-efficacy in using computers for instructional purposes are highly correlated. Few studies found that self-efficacy has a deep impact on the online learning experience and knowledge even the perseverance to complete an online course (i.e. [Kim and Park, 2017](#); [Song et al., 2011](#); [Tang et al., 2014](#); [Shen et al., 2013](#); [Prior et al., 2016](#)).

Out of 50 studies, 40 studies were purposively chosen from the Asian context where technology inclusion is very irregular, gender disparity is very popular and skilled teachers are a rarity; here self-efficacy of the participants could be a good instrument amidst impediments, which could provide them an intrinsic motivation to sustain in the teaching–

learning activity and continue their fight against the odds (Chiu and Tsai, 2014; Kundu *et al.*, 2020). Hong *et al.* (2017) mathematically established a positive relationship between Chinese learning intrinsic motivation and online learning self-efficacy. The studies (e.g. Kundu *et al.*, 2020; Lim *et al.*, 2016; Shen, 2015; Kuo *et al.*, 2014; Chiu and Tsai, 2014; Joo *et al.*, 2013; Zhang *et al.*, 2012; Chu, 2010; Song *et al.*, 2011) also found almost in the same tune that self-efficacy has a deep impact on the participants' personal innovativeness, communication climate, holding strong perception toward online infrastructure, motivation, asynchronous communication, learner–learner communication or learner–teachers' communication and knowledge sharing in online mode. Hence, policies to strengthen self-efficacy of the participants could prove effective in the Asian online education context.

RQ2. Factors influencing self-efficacy in online education

An in-depth analysis found several factors influencing participants' self-efficacy for online education that posit human performance technologists must consider those factors when developing training interventions. Chu (2010) found that emotional family support plays a major role in enhancing Internet self-efficacy, while Chu and Chu (2010) found peer support and e-learning outcomes play as important predictors. Law *et al.* (2010) found a well-facilitated e-learning setting can enhance self-efficacy for online learning, while Song *et al.* (2011) found prior knowledge of online system put a direct effect on online efficacy and participants. Jashapara and Tai (2011) found personal innovativeness with information technology (IT) showed a significant effect on e-learning system self-efficacy, and computer playfulness had a significant positive effect on e-learning system self-efficacy. Zhang *et al.* (2012) found the psychological safety communication climate as a predictor, Shen *et al.* (2013) found the number of online courses, Wang *et al.* (2013) found motivation as a palpable predictor and Chiu and Tsai (2014) found the associated social factors influence self-efficacy for online education. Kuo *et al.* (2014) suggest that the ability to use the Internet has a positive effect, which is further supported by Taipjutorus (2014). Lin *et al.* (2008) found social presence as a strong predictor of self-efficacy, while Shen (2015) found the trust between participants as a strong predictor, and Lim *et al.* (2016) found learner–learner interaction and system quality was related to learners' computer self-efficacy. Among other factors influencing self-efficacy for online education are attitude and digital literacy (Prior *et al.*, 2016), perceived enjoyment (Reychav *et al.*, 2016), community involvement (Vayre and Vonthron, 2016), personal innovativeness (Kim and Park, 2017) and particular education system of the country (Gerick *et al.*, 2017). The studies of Liou *et al.* (2016) and Wang and Wu (2008) have reported the benefits of feedback and incentive are important factors influencing self-efficacy in online education to find out whether they attain their goals in learning. Online communication was claimed as an important factor influencing self-efficacy in online education, as stated in studies of Lim *et al.* (2016), Cho and Cho (2017), Lin *et al.* (2015), Reychav *et al.* (2016), Shen (2015) and Vayre and Vonthron (2016). Considering the significance of self-efficacy in online education, there is a need to identify and understand these factors influencing participants' self-efficacy. A brief diagram of the factors is furnished for easy understanding in Figure 5.

RQ3. Proposed framework for strengthening participants' self-efficacy

Based on the above analysis, the author proposed a framework for strengthening participants' self-efficacy for online education in the following diagram (see Figure 6) along with few intervention measures presented in Table 3.

Verbal persuasion. The proposed framework presumes that verbal persuasion builds self-efficacy when a respective environment is encouraging and praising individuals with feedbacks for their competence to improve their effectiveness. Empirical evidence behind this proposition is found in a series of studies taken up in this document analysis like Wang and Wu (2008), Chu (2010), Wang *et al.* (2013), Chiu and Tsai (2014), Tang *et al.* (2014), Jan (2015),

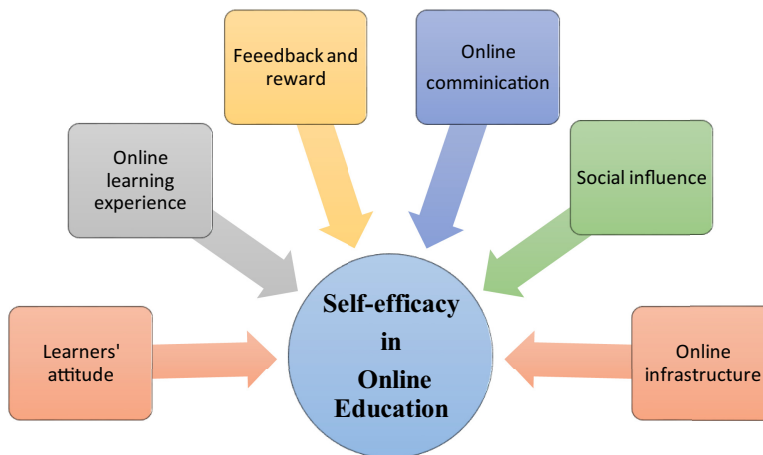


Figure 5.
Factors influencing
self-efficacy in online
education

Lin *et al.* (2015), Shen (2015), Liou *et al.* (2016) and Hong *et al.* (2017), etc. Positive self-talks, informal communications, human relationships, etc. can also raise the self-efficacy level of the participants. The author also concerns with the fact that although encouraging messages have the potential to raise self-efficacy, there are chances that it may collapse into bare sermons unless they are supported by efficacy-affirming experiences (i.e. enactive self-mastery with controlled affective domains). Effective verbal persuasion is needed to be reinforced with corresponding actions. For example, telling individuals that they are capable but not assigning them any practical tasks tends to erode both learners' self-efficacy and the teachers' credibility. The corresponding measures for verbal persuasion domain are presented in Table 3 for both students and teachers. Verbal persuasion may not be possible or practical in several online courses, but a possible equivalent may be convincing a feedback mechanism through email notes, WhatsApp messaging or phone calls to manipulate learners' self-efficacy. The interventions involving written communication were also there in Bandura's verbal persuasion category (Bandura, 2001).

Role modeling. Role modeling reinforced through vicarious experiences or social models. It may be difficult to include vicarious experiences in online education, yet the success stories of peers in the field could be helpful in this context. Empirical evidence is also found in the study of Lin *et al.* (2015) who said social presence is an important predictor of self-efficacy and in the extended expectation confirmation model propounded by Tang *et al.* (2014). Observation of models has been investigated and shown to be important for formation of self-efficacy beliefs (Jashapara and Tai, 2011). Hodges (2008) found the solitary often asynchronous environment of online courses does not readily promote opportunities for observing peer observation, yet he empirically proved self-efficacy to learn mathematics asynchronously (SELMA) was positively correlated with the academic achievement of the learners. Here, pedagogical agents for learning (PALs) may be a possible alternative for addressing the vicarious learning component of self-efficacy development in the online educational environment. PALs are explained by Kim and Baylor (2006) as "animated life-like characters" (Johnson *et al.*, 2000) that are inserted in instructional applications, and it is the ability to simulate social interaction that makes PALs unique form of conventional computer-based environments (p. 570).

Self-mastery. Self-mastery is the development of skills, like thinking, intuiting, communicating, leading, feeling, doing and being, necessary for any academic

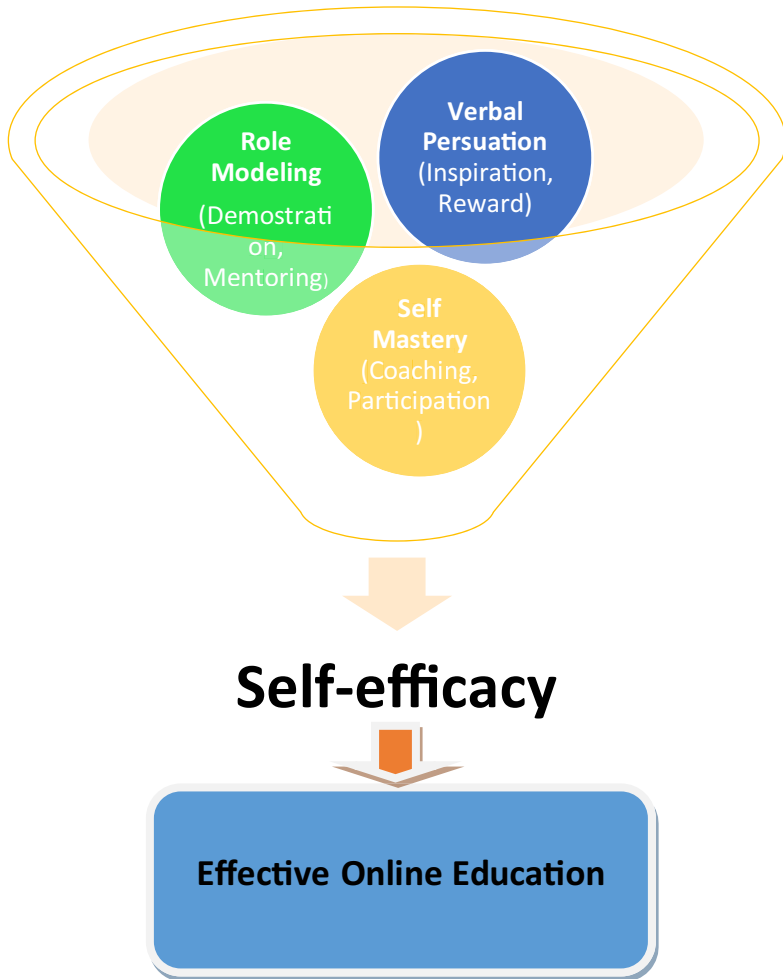


Figure 6.
Framework for
enhancing self-efficacy
for online education

achievement and viewed as the ultimate learning goal (Cunanan and Chua, 2015). Self-mastery is most vital in strengthening participants' self-efficacy in online education, which is reinforced through suitable coaching, practice and participation. Enough of empirical evidence is found in this analysis behind this proposition where learners were found to exhibit more online self-efficacy having more online exposure (Song *et al.*, 2011), with the increase in the number of online course adopted (Shen *et al.*, 2013) and with the increase in computer self-efficacy (Kuo *et al.*, 2014). Kuo *et al.* (2014) point out that increase in teachers' technology self-efficacy might directly increase their acceptance of technology and also indirectly increase their usage of technology. Furthermore, Shen *et al.* (2013) asserted that technology self-efficacy has come to play a crucial role in the preparation and implementation of educators who can successfully use educational technology to enhance student learning. This suggestion falls in line with the self-efficacy literature in that beginning with lower-level skills creates opportunities for learners to have early successes before tackling more difficult material. Before self-mastery to take

Domains	For teachers	For students
Verbal persuasion	<ol style="list-style-type: none"> (1) Encouragement, regular feedbacks, visions from respective school authorities and governments to teach online (2) Teacher–teacher interactions will courage their ability and efficacy (3) A clear vision before teachers regarding what to teach, how to teach and access will help their smooth function (4) The stress produced during teaching online, especially from inabilities, needs to be reduced by suitable mentoring and peer support 	<ol style="list-style-type: none"> (1) Encouragement from parents, teachers and society as a whole will enhance their use of online learning (2) Constructive feedbacks from teachers and parents will help to strengthen their self-confidence (3) A clear vision from school authorities and teachers when and how to get benefits from online learning will enhance their belief. The vision and guidelines for how to overcome the infrastructural limitations are also important here
Role modeling	<ol style="list-style-type: none"> (1) Success stories of teachers who get exceptional success in teaching through online learning should be put before them (2) Several model teaching procedures using teaching apps like Zoom, Kahoot, Seesaw, Google classroom, Remind, Classtree, Dropbox, YouTube, etc may be given to the teachers to enhance their self-belief (3) Pedagogical agents for learning (PAL) may also help in strengthening vicarious experience Kim and Baylor (2006) 	<ol style="list-style-type: none"> (1) Peer support or peer learning plays a big role. If friends can learn online, why cannot I? The student is expected to put more effort to overcome his/her weaknesses, and it will enhance his efficacy (2) Animated life-like characters Johnson et al. (2000) embedded in instructional applications or instructional videos and models may serve this purpose (3) Self-efficacy starts with autonomy and self-regulation. Children who are allowed to decide for themselves and choose their ways are more self-reliant and independent. It is always a good idea to let them choose their tasks, so that they get to do what they want to and not lose interest in it
Self-mastery	<ol style="list-style-type: none"> (1) When teachers overcome their obstacles and setbacks with perseverance and resilience they will attain mastery over the online teaching that will strengthen their self-efficacy belief (2) More practice makes him/her more confident about his/her abilities/skills and reduces his/her chances of failing in the real task (3) To increase employee self-efficacy, organizations can conduct specialized training programs and orientations that promote self-efficacy (4) Allowing teachers to express their opinions, active feedback mechanisms, prioritizing targets and helping them with time-management and organizational skills 	<ol style="list-style-type: none"> (1) Students also after overcoming their weaknesses will attain mastery in learning through online that will enhance their sense of efficacy (2) Students will learn from their past success and failure, for this they need to be offered with a democratic and cooperative learning atmosphere (3) One students' attainment of self-mastery may encourage others; hence, success stories need circulations

Table 3.
Attentions teachers
and students need in
different domains of
self-efficacy

place, earlier two stages – verbal persuasion and role modeling – need to be followed. Thus, to make this framework effective, an institutional ecosystem that develops a desirable culture among all stakeholders and that invests in support services and

infrastructure, such as reliable Internet connections and technology, is necessary. At the same time, institutional vision, leadership and attitudes have a direct bearing on participants including institutional policies on teacher professional development, and the expectation of technology use within teaching and learning, cognizant of potential digital divide issues including student ownership of devices that are incompatible with institutional devices, student's social background, family income and their capability to afford devices need to be considered, as all these have an effect on their efficacy in one way or the other.

Conclusion

The study reached to this conclusion that self-efficacy is the key to success in online education; hence, a proper understanding is essential. In total, three major sources of self-efficacy – role modeling, verbal persuasion and self-mastery – have been discussed in the context of online education, their roles have been reviewed, especially in the Asian context, and the proposed model is presented along with respective intervention measures. The proposed framework revealed that all stakeholders of online education – students, teachers, institutions, society and parents – have crucial roles for its implementation. The author hopes the framework will prove useful for students, educators and developers operating online, especially for the millions of first-generation and inexperienced participants of online education, who possess low self-confidence in their abilities. However, the proposed model needs to be tested empirically. Hence, this study has a wide scope of future work by conducting empirical studies to test the validity of the model in several socioeconomic contexts.

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