Exploring self-efficacy beliefs of Pre-Service Teachers: An evidence from biological science education program in Bangladesh

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Abstract:

Teacher education program equips teachers with skills and competencies for teaching-learning process. An essential part of teacher education program is referred to as practicum. The context of Bangladesh is mostly speculative and theoretical, dealing with concepts of belief and practice of science teachers in classroom only. However, the aim of this is to explore whether the practicum experiences of pre-service teachers (PSTs) in biological science education contribute to shaping and developing self-efficacy beliefs. A qualitative approach with documentary research was adopted for this study. The portfolio of nine PSTs along with interview were used as the principal sources of data. The result reveals that during practicum, the biological science education program has contributed to all the four aspects of self-efficacy beliefs, naming, mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states. This study highlights the need for biological science education to offer various circumstances to further self-efficacy beliefs.

Keywords: Self-Efficacy Beliefs, Practicum Experience, Preservice Teachers Mastery Experiences, Vicarious Experiences, Verbal Persuasion, Physiological and Affective States

Introduction

The development of a sustainable knowledge society requires quality education, and teachers are the most critical mediator in ensuring quality education (Paulo, 2014). But teaching is always entangled with several challenges like changing student demographic patterns, changing technology, and growing concern about how people learn and what makes for effective teaching (Fekede & Gemechis, 2009). Therefore, becoming a teacher mostly remains complex all the time. To address this diversity of learners and fluid context, teacher education program is of certain importance which continually finds ways to respond to these challenges and attempts to equip teachers with skills and competencies for teaching-learning process (Avalos, 2011; Lyonga, 2015). A clear understanding of what and how to teach is crucial to teacher education. Shulman (1986) mentioned this as a combination of art, craft, and science. That means

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pedagogically meaningful integration of technology with content is essential to achieve the expected level of teaching. In other words, best teaching practices mean combining content knowledge with sound pedagogy and technology. An essential part of a teacher education program is practicum where understanding of combining these core elements of effective teaching is obvious. It is a very particular period when pre-service teachers (hereafter PSTs) are placed in schools to practice teaching (Hardman, 2012; Komba, Kira, 2013). Ljundahl (2006) states practicum examines how teaching in a culture other than the instructors' own broadens the perspectives of being teachers and boosts their confidence as teachers. That means PSTs get the opportunity of making groups, and then they interact with a culturally different teaching family of an educational institution along with the embodiment of practical teaching experiences of that institute. Therefore, a significant range of benefits results from a practicum, i.e., cultural involvement, acquisition of additional materials and ideas of teaching, sharpening professional capabilities, developing of professional learning community and the sense of professional development among PSTs (Admiraal, Akkerman & Graaff 2012). In addition, the practicum is an executive platform where the PSTs can range over and expand their learnings on pedagogical accomplishments and various theories on teaching learned from the teacher education programs (Komba and Kira, 2013).

During this course, assimilation and reflection of philosophical knowledge and pedagogical skill implant the seed of self-identity among the PSTs both inside and outside the classroom (Mbalamula, 2016; Merç, 2015; Mosha, 2012). Alongside practicing teaching, it is the platform for the PSTs where development of other professional etiquettes takes place through actual classroom practice (Opfer & Pedder, 2011; Payant & Murphy, 2012). The acquired skills and abilities or etiquettes, Clark and Peterson (1986) mentioned as a behavior are guided and shaped by the belief, values and principles of individual teacher. As a result, beliefs are frequently found to precede conduct, for example, individual practice is influenced by beliefs (Pajares, 1993).

Researchers charted the influences of teacher's beliefs revealing intriguing new facts about instructional activity and student learning (Rahman, Singh, & Pandian, 2018; Rahman et al., 2019). For instance, teachers' subject-specific personal views and classroom practice are directly and causally related and influence the overall classroom environment. According to Grossman, Wilson, and Ernest (1989), teachers' beliefs have a significant impact on their instruction. Similarly, according to Borko and Putnam (1996), teachers' knowledge and beliefs about teaching, subject matter, and learners are important factors that influence what they do in the classroom. Therefore, it is generally accepted that teachers' views serve as an explanation for practice (Skott, 2009). Another study on instructors' views found—and to some extent still finds—that these beliefs strongly influence classroom activities (Fives & Buehl, 2012). This study further supports what Pajares (1993) had long before identified as the most reliable indicators of individual behavior.

Self-efficacy belief of teacher

According to Bandura (1986), self-efficacy belief, among other beliefs, is the most important key component of social cognitive theory. Self-efficacy generates its impact on reasoning, motivation, decision-making processes (Bandura, 2006). Along with it, figure 1 demonstrates how other characteristics of self-efficacy beliefs have frequently been found as practice predictors, such as classroom structures (Ciani, Summers, & Easter, 2008), culturally receptive teaching (Siwatu, 2009), and instructional strategies (Thoonen, Sleegers, Peetsma, & Oort, 2011).
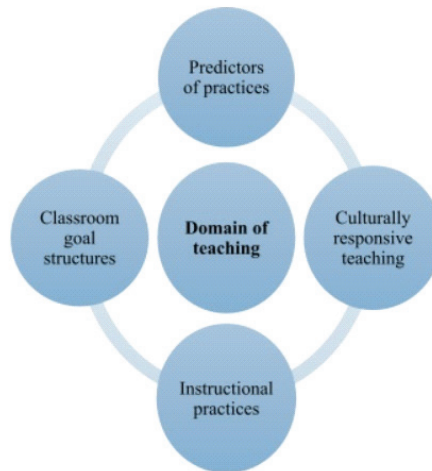

Fig1: Aspects of self-efficacy

Self-efficacy in teaching is the assessment of a teaching ability and it judges the capability and skills of teachers to achieve desired results for student engagement and learning, especially among unmotivated students (Tschannen-Moran & Woolfolk Hoy, 2001). Studies show that, in the case of practicum, it promotes behavioral and personal changes to establish and strengthen belief in becoming teachers (Anderson, Walker & Ralph, 2009; Gurvitch & Metzler,2009). Taken in its simplest form, if teachers do not find teaching conducive, they immediately abandon the profession (Mbalamula, 2016).

Rationale of the study

Studies in the field of science teachers' beliefs in Bangladesh have mainly dealt with the concepts of belief and practice (Rahman, 2008; Mansour, 2009; Siddiquee, 2014). For example, Rahman (2008) found that secondary science teachers' beliefs positively influence practice and their instructional practices varied according to beliefs in classroom settings. From that study,

he postulated a hypothesis that belief might be a reason that influenced teaching in the earliest days in Bangladesh. Mansour (2009) further opined those beliefs are personal pedagogies and theories that guide teachers' practices. It means that teachers develop their own ways of teaching following their belief system. For example, science teachers who believed inquiry-based teaching is vital in science teaching learning practiced inquiry-based teaching (Hoq, 2019; Polly et al., 2013). Siddiquee (2014), on the other hand, focused on beliefs and views of content knowledge of science teachers. Therefore, in one form or another, there remains a gap in whether teachers' beliefs are developed through any teacher education programs in Bangladesh, like the biological science education program for bachelor's degree. As academic success and scientific skills increase with self-efficacy belief (Ommering, 2021), hence, it is crucial to understand how PSTs consider their teaching experiences during practicum in shaping and developing their self-efficacy beliefs.

Theoretical framework
The sources of Self-Efficacy hypothesis

Self-efficacy beliefs proposed by Bandura (1986) is used in this study as the purpose of the study is to explore how PSTs regard their teaching experiences and how they view practicum as sources for developing self-efficacy beliefs. The key aspect of the theory involves mastery experiences, vicarious experiences, verbal persuasion, physiological and affective states. The following section elaborates the aspects.

Mastery experiences: It is the most crucial source of efficacy according to Bandura (1997). According to him, individuals learn best from interpreting the past. Success from previous experience can develop strong positive efficacy, whereas repeated failure can reverse the result. It regulates both positive and negative experiences (Figure 2). Therefore, if a teacher becomes satisfied with his performance, then it is likely to expect his future performance to be more satisfying.

Fig 2: How positive and negative experiences influence performance

The most potent source of self-efficacy is the enactive mastery experience as it provides the most authentic indicator of whether one can master what is needed to succeed (Bandura, 1997). Within the context of teaching, enactive mastery experience is the act of teaching by the individual. Amid all the experiences mentioned by the PSTs, the most recurrent know-how was the scope to apply theoretical knowledge to real scenarios involving teaching in a different context and preparing themselves for future professional development.

Vicarious experiences: It is the second source of self-efficacy. Figure 3 describes how the vicarious experiences can be developed. It simply can be gained by observing others in similar experiences whether becoming successful or failing and then judging their own abilities. Sometimes observers may have little personal experience (Mohamadi et al. 2011).
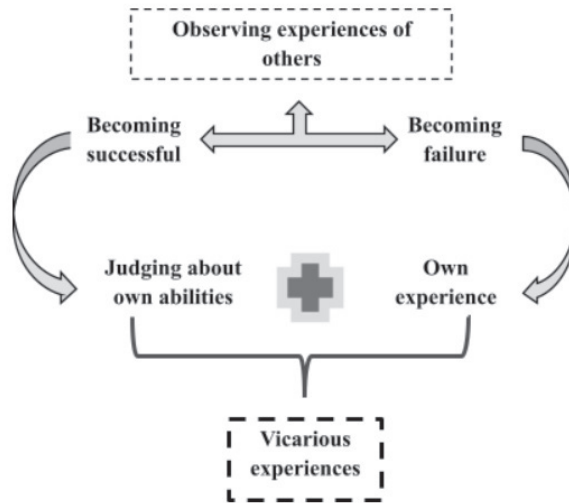
Fig 3: Process of developing vicarious experiences

Verbal Persuasion: In an educational setting, it is the verbal interaction received regarding teaching-learning process from other important members of the community at large like administrators, colleagues, and parents as these members have the potential to persuade others for their credibility, trustworthiness, and expertise (Bandura, 1997). This source of efficacy information usually only persists for a short time. It is simply the flow of information conveyed to one PST from others.

Physiological and affective states: This is another source of efficacy where emotional stimulations adjust an individual's belief about their capabilities. It can be either motivating or frustrating depending on the interpretations and integration from the sources of belief. Each source contributes according to the domain and cognitive processing of the individual

(Mohamadi et al. 2011). Physiological and affective state means an individual learns to engage in incidence in combination with the first three sources of self-efficacy (Figure 4). It has a significant impact on an individual's self-efficacy. According to Bandura (1997), emotional and physiological states, such as anxiety, fear, and diffident can impact belief about potentialities resulting in either absolute success or complete failure. It means that if a person's belief in success can provide positive feelings like confidence and comfort, then on the other hand, feeling of failure can lead to negative feelings like shyness and fear.
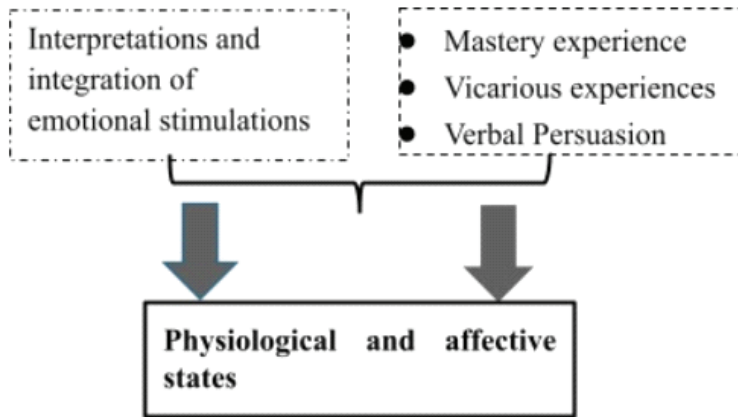
Fig 4: Impact of emotional and physiological states on belief about potentialities

Method
Study design

Interpretivist ontology embraces relative and complex individual perception through intersubjectivity (Alharahsheh & Pius, 2020). Therefore, an object is defined based on how an individual describes it (Weber & Henderson, 2012) and involves symbolic interactionism between social and contextual factors (Alharahsheh & Pius, 2020). Such interpretivist view helps to the better exploration of a phenomenon (Cohen et al., 2011). Therefore, the interpretivism approach for this study is more appropriate as the central phenomena of this study is to understand the role of practicum in developing self-efficacy. As, interpretivism emphasizes qualitative analysis (Alharahsheh & Pius, 2020) therefore, a qualitative approach with documentary research was adopted to identify whether practicum experiences contribute to shaping and developing self-efficacy beliefs. Interviewing students also helps to gather and validate data. The limitation of the objectivist view of interpretivism (Alharahsheh & Pius, 2020) was overcome by random data selection (Lincoln & Guba, 2006). The overview of the ethical stances is three-fold.

- The use of theory helped to overcome the challenges of personal views

- Critical objectivity was maintained in the case of epistemological and onto-logical knowledge

- Random data selection and detailed description of context supported the methodological ethics

Participants

At IER, practicum activity is a requirement for degree completion. PST enrolled during the 2016-17 academic year were placed in urban public schools depending on the schools' availability where they conducted biological science classes. Among the nine participants, five were female, and the rest were male and around 22 years old. Participation was voluntary.

Ethical consideration

There were two-fold ethical considerations for the whole study. The first ethical issue included the ethical deliberation by the supervisor. The under-documented chart describes the deliberations.

Table 1: Ethical deliverable by the researcher

Ethical consideration					
Planning	Making contact	Sampling	Data analysis	Writing	Aftermath
-Deciding the partici-pant lists -Not dis-closing it	-Setting initial communication -Coming up with consents	-Maintaining confidentiality	-Maintaining confidentiality -Maintaining knowledge validity -Zero manipu-lation -No biasness	-No bleach of confidentiality	-Continue and maintain the confidentiality

Second and most importantly, the retainment of fundamental and principles of consent along with confidentiality and no harm to students (Gibton, 2015) will be the core ethical consideration during the study. As the participant teacher will be selected conveniently, the degree and scope of confidentiality between the researcher and the participant teacher will be

negotiated initially by notifying the aims and objectives and sharing the methodology before making them subject to agree or disagree to participate. The confidentiality will be not only within the school premises but also within other and adjacent organizations. The end step of the consent and confidentiality will include the permission of the school authority.

Study Context

Data collection started in January and ended in June 2019. Participants conducted three biology classes of secondary school science classes per week with the permission of the school authority during the practicum. Participants also arranged co-curricular activities like club activity, science fairs, debates on biological sciences issues, cleaning program, and regular teacher activities at the school. Supervisors from the biological science wing of IER were assigned to overall supervision, and the supervisor collected the data. Preceding to practicum, the participants went through a discussion session to develop an understanding of the purpose of the research and their role in the research. The session was arranged to inform participants to give the maximum effort to their teaching and learning so that the students can be provided with the best at school (Kabilan, 2013). While practicing such, participants are supposed to be able to signify their ability to assess not only their own practice but also PSTs are expected to understand whether their practices are making a strong and purposeful impact on the complexity and intellectual and emotional challenges of teaching (Hammerness et al., 2002). They were also advised to make the maximum entries on issues they find essential for their requirement of degree completion and professional development in becoming a biological science teacher.

Anonymity of participants was ensured by using random numbers to the portfolios and the abbreviation Port for portfolio was used. Thus, the portfolios were labelled from Port 01 through Port 09.

Data Collection
Research Instrument

The portfolio was used as the principal data source as it has self-reflective and self-evaluative value in the teaching-learning process (Senne & Rikard, 2002). As a result, a portfolio is a complete package of records of the development of PST to learn how and what to teach. It also provides scope to critically reflect on the four significant aspects of science teaching. The four steps are planning, conducting, processing and evaluating (Hakcling and Fairbrother, 1996). Along with these, the portfolio also reveals both positive and negative aspects of one's belief (Berrill & Addison, 2010). Every reflection on performed activity makes individuals more conscious about personal and professional strengths and weaknesses and enhances self-efficacy belief (Von, 1992). Furthermore, portfolio preparation during practicum assures the quality of profound rethinking about the content and approaches. Such a process of thinking

and rethinking prepares PSTs as more confident to teach (Darling-Hammond & Snyder, 2000; Zeichner & Wray 2001). Therefore, the use of a portfolio as a research instrument will provide better opportunities to explore personal and professional growth of PSTs (Berrill & Addison, 2010). For such, qualitative analysis of the portfolio will be the best source to develop the self-efficacy belief.

The portfolio is a collection of materials that validated the knowledge and competencies of an individual (Senne & Rikard, 2002). The portfolios were the documents of nine PSTs prepared during the practicum, offered by the biological science education teaching program at IER. At the end of this period, participants were asked to consider the (i) teaching and learning process and environment (ii) discussion and orientation between classmates and professors, (iii) applying pedagogical knowledge and skills; (iv) physiological and affective states, including self-efficacy (v) challenges faced (vi) exchange of experiences and reflection about own practice. Following the instruction during the session, participants produced their portfolios to facilitate their reflective processes and documented their professional journey of practicum (Gil-Garcia & Cintron, 2002).

Data Analysis

Qualitative data analysis aims to construct an authentic narration of what surfaced in the study. The theoretical framework of self-efficacy of Bandura (1986) was used here to develop the theme.

Creswell (2007) describes the general process for qualitative data analysis, which includes, firstly, preparing and organizing the data through repeated reading of each portfolio to identify the core theme. This step makes the identification of both expressed and latent contents because it is essential to go beyond the examination of the explicit contents and materials and reveal contradicting dimensions, and themes that have been purposefully hidden (Iaochite & Costa, 201).

Secondly, reducing the data into themes through coding and condensing the codes into easily manageable descriptive categories. In this research, this category involved teaching-learning activities at school, influences of university classes, and the perceived ability of PST to teach biological science finally, representing the data in themes, figures, tables, or discussions based on the four above-listed sources of self-efficacy (Bandura, 1996) to objectively present the findings.

Particularly in this study, generally, these steps were followed to analyze qualitative data. A graphical presentation of data analysis is shown in Figure 5. A thematic data analysis was conducted, and the theoretical framework of self-efficacy of (Bandura, 1996) helped to develop the themes.
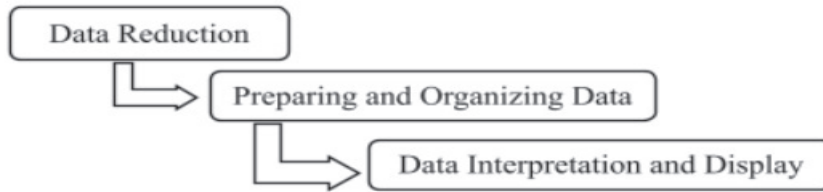
Fig 5. Steps of data analysis

Result and discussion

The study aimed to explore whether practicum has contributed to the development of self-efficacy belief. From the analysis of the developed portfolio and interview, four themes emerged from the theoretical framework of self-efficacy of Bandura, are presented in Table 2 and is described in the following sections.

Table 2. Outcomes of PSTs practicum experiences

Themes	Criteria
Mastery experiences	Findings indicate during practicum, PSTs have *increased confidence*, learnt to *apply teaching methods in a classroom confidently, and given up shyness.*
Vicarious experiences	Findings indicate during practicum, PSTs have *developed competency to compare and decide according*, *problem-solving method, multiple ways of teaching-learning (MWTL), association methods* by observing others.
Verbal Persuasion	Findings indicate during practicum, PSTs have overcome the *experiences of fears and problems after talking with friends and supervisors and trying for a solution.*
Physiological and affective states	Findings indicate during practicum, PSTs have overcome the *"cumbersome"* status as *graceful experience, satisfied.*

Enactive Mastery Experiences

Data reveals that PSTs were initially "really afraid" and feared being "challenged" but gradually started "feeling wonderful" "to apply teaching methods in a classroom", acknowledging to have scopes to practice theoretical knowledge. They mentioned, "practicum enhanced knowledge about teaching, teaching strategies and students' behaviour learnt at classroom" (Port 02).

PSTs continued, "it increased self-confidence providing the opportunity to apply the previously studied theories and methods of teaching-learning process" (Port 01). To act as a facilitator in practicum, PSTs were "excited to apply the different types of pedagogies and teaching methodology in a real school environment and get acquainted with more first-hand experiences to adopt in the school environment" (Port 04). To them, "it assisted in giving up shyness and developed oneself as a confident person. Therefore, it is the best semester for grooming ourselves" (Port 05).

Another stated, "...whatever I have learnt through the practice has made myself more poised, more involved, more active as I had a chance to prove myself" (Port 08).

With a similar tone, another PST added,

> *All I can say is that practicum turned me into a brand new, self-assured, strong person not only as a teacher but also as a person. It taught me how my knowledge could be reflected through practice. I got very good experience in my life during this practicum for further development of my life (Port 09).*

Such comment is commensurated with the comments of Port 02.

> *Practicum is a blessing for those who are eager to be a teacher. I am overcoming my weakness and gaining confidence by applying teaching -learning techniques. I am applying every trick practically, for example-managing students, classroom communications, maintaining time, working through a lesson plan, preparing students for tests, encouraging students for reading, writing in a standard way. I am equipping myself with pedagogical skills. Not only this, but domains of knowledge are being tested through this process (Port 05).*

Moreover, while different context is considered, Port 06 mentioned, "everyone knows learning and knowing is different from applying. Sometimes we learn small things very easily but applying them anywhere is very difficult. Practicum is a good way to explore different contexts".

The above quote along with the repeated reference to putting knowledge into practice and gaining expertise to teach in different contexts indicates that the practicum had a remarkable impact on the development of personal belief in PSTs.

Such a finding is similar to the studies of Iaochite and Costa (2020). PSTs develop a reflection on their knowledge, potentialities, and competencies as soon as they enter the world of practicum. This reflection, in the long run, helps PSTs to form and support their belief, abilities, and competencies. Therefore, the practicum is of fundamental relevance (Iaochite & Souza; 2014) to reflect knowledge into practice for personal and professional development of future life.

However, PST encountered several constraints and obstacles not limited to physical and natural resources only. "I had to struggle with my strategy. At first, the most difficult challenge was to tackle the students" (Port 05).

Such a quotation clearly mentions different situational challenges faced by the PSTs before the accomplishments of graduation. Handily overcoming such situations increased confidence in their own capacities. Port 05 continues, "but after some classes, I gained the experience of tackling them. Every student has his/her own thoughts. I've learned to explore their different thoughts".

The next challenge was "the classroom does not have enough access to natural light. Therefore when I was teaching photosynthesis with a real plant, I had to use a torch light as a replacement for sunlight (Port 03)".

Another mentionable challenge was the presence of students with developmental growth. One participant mentioned it was tough to calm down special students. "I had to manage him in ways that are not taught in any lectures or curriculum" (Port 4).

Managing the lack of resources in creative and effective ways and overcoming the possible adverse situation during practicum have enriched PST with robust and buoyant self-efficacy beliefs. It confirms the assertion of Bandura (1986) that to create examples of success for developing vigorous belief, one has to surpass the potential defies. This is possible only after practicum (Gurvitch and Metzler 2009). According to Gurvitch and Metzler (2009), the unavoidable counterproductive aspects of teaching in actual school settings impose potential stress and challenge to equip PSTs with the ability to cope with challenges. They mentioned the experiences of hardship like lack of natural resources, infrastructural facilities, school environment, the behavior of the school teachers and officials, and the nature of students. though lastly, PST managed to have some influence over the students.

> *In my first class as a teacher, I found a few students who were inattentive and talking among themselves in the class. That was kind of a new and uncertain situation for me. I managed to take control of the class by asking them questions. And when they failed to answer, I cordially told them, it is not a good feeling for a teacher trying to teach something and students are not listening and interrupting the class. Later, those inattentive students were cooperative and participated in the class (Port 02).*

Similarly, Port 07 wrote with a smiley emo and mentioned, *my students complimented me for my patience- we respect you as you never scolded, instead, tried to make us understand the content and managed the class"*. However, such compliments make it possible to distinguish some influence of PST over the school setting due to lack of discipline.

Vicarious experience

In the domain of teacher efficacy, vicarious experience indicates learning from how a teacher is doing in a classroom. Analysis of portfolios also reveals that PSTs find it very much important to observe the classes of their friends, hitherto unknown as different contexts for them to explore pros and cons. It allowed PSTs to compare expertise developed in different situations. PST confessed, *I found my friend reaching to every student, using teaching aid effectively, making eye contact with students and was managing class moving all around instead of standing in front. The very next day I tried the same'' (Port 02).* Therefore, according to him, observing classes can play the role of transmitting knowledge passively and helps observer to learn out-of-sight strategies to overcome challenges within and outside of the field experience (Bandura, 1986).

On the other hand, another PST stated, *I have gradually improved teaching skills with the help of my friends, supervisors and professional teachers of the school simply by modelling them'' (Port 04).*

Such a quotation is like the definition of self-efficacy during the vicarious experience of Bandura (1986). According to Bandura, a vital tool that enhances self-efficacy during the vicarious experience is modelling from other individuals.

Self-efficacy theory argues, this type of experiences mostly influence the efficacy of individuals among the other three sources and self-efficacy can only be altered by comparing the competencies and attainments of others (Bandura, 1997).

"When I compared my teaching with others, I felt I needed to work on my time management skills following their strategies" (Port 07).

One PST also mentioned:

> *I observed the teaching practices of my friends. We used different teaching methods considering the situation demands. As a facilitator of biological science education, most of our teaching-learning requires demonstration. Therefore, I used various methods like problem-solving methods, multiple ways of teaching-learning (MWTL), association methods etc. Most of our friends from the social science or language stream used guided group discussion methods. Admitedly, I developed my competency to compare and decide according to what my subject demands and how I can help my students best to simplify learning (Port 06).*

Therefore, findings are familiar to Bandura (1997, p. 88) as "acquisition of effective means raises beliefs of personal efficacy". Iaochite and Souza (2016) mentioned vicarious experiences supporting the development of self-efficacy among PST teachers enabled them to solve problems in adverse situations experienced in teaching practice.

Verbal persuasion

Data informs the occurrence of verbal persuasion as the PST accepted the suggestions and reflected those in their actions and achieved success. When sharing with the supervisor is considered, PST mentioned,

> *I have shared my positive and negative experience of practicum with my supervisors. It was very helpful. They gave me a lot of advice and encouraged me a lot* (Port 01).

On the other hand, Port 07 mentioned:

> *Very often, we discussed our experiences of fears and problems with friends and supervisors and tried for a solution. My friends used to give me several ideas to deal with students, which helped me find effective teaching methods*.

Also,

> *I discussed my experiences with my friends as I found it helpful. Primarily I was facing problems regarding managing the students. But I got some suggestions and techniques from my friends, which later worked effectively. For example, to keep students engaged in learning, when students accomplish their tasks perfectly, the whole class greets one another with their thumbs up. Besides engaging, it kept the class silent, and management became easier and effective* (Port 03).

Similarly,

> *Mostly we discussed how well we were able to deliver the lesson in class, manage the class and handle the next lesson if it's a little bit complex etc. This type of discussion made our day-to-day internship life easier* (Port 05).

That says, verbal persuasion is important for the development of self-efficacy.

Physiological and affective states

Initially, almost every PST mentioned more feelings of fear, anxiety, lack of confidence, nervousness, shyness at the beginning. However, analysis of the portfolio reveals that such "cumbersome" status later was altered to "confidence", "graceful experience", and "satisfied". During the practicum, PSTs experienced the feeling of confidence over anxiousness and fear and learnt more about their positive strength as Port 2 stated, "*I feel like my level of confidence has bulged at the seams! Now, I don't feel uncomfortable and hesitated anywhere during any exposure*".

Accordingly,

> *... I was terrified when it (practicum) started as I had never faced so many students at a time in a classroom. But a few days later, I started getting positive feedback from them (students)! I got to take control over the class also. The experience turned amazing within one and a half month* (Port 06).

Such quotations are promising for PSTs because, according to Bandura (2006, 1997) as such experience triggers to influence our own environment and exert to make things happen.

Implications and conclusion

The aim of this study was to explore whether practicum experiences contribute to shaping and developing self-efficacy beliefs among the PSTs of Bachelor's degree program in biological science education. Findings were significant as they reveal that under different and various simulated condition, PSTs of Biological science education successfully continued teaching activities. In simulated situations, PSTs had more chances to learn and teach one other and that helped to develop teaching related self-efficacy. The challenges of mastery experiences like the real-life situations have been found to develop robust and sustainable beliefs and competencies. It means that mastery experience was better developed during practicum and this study further recommends focusing more on developing such efficacy. Therefore, the strength of this study is to identify enactive mastery experience works best for the development of self-efficacy.

For better educational practice, this study also suggests emphasizing more on the rest three sources of self-efficacy and strengthening those during practicum. These sources reinforce enactive mastery experiences and exert important influences that enable PSTs to establish and strengthen personal beliefs.

Thus, this study highlights and recommends providing more real-life and simulated circumstances during micro-teaching so that PSTs get more chances to apply theoretical knowledge into real life and become more equipped with skills and competencies.

This study considered the socio-cognitive perspective only but cultural and psychological aspects.

This study offers to more analysis on the other sources of self-efficacy. It also opens the opportunity to explore how PSTs construct and strengthens their self-efficacy belief.

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