

Effects of external feedback on disengagement in a human-centric environment

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Abstract:

BACKGROUND: Overcoming the disengagement feeling in a human- centric environment such as a workplace or a school is essential. In fact, the disengagement in a workplace or at school is one of the major challenges today. Lack of meaningful engagement contributes to this feeling.

OBJECTIVE: It is to assess the impacts of external feedback on learning and development. External feedback reflects engagement with the disengaged learners.

METHODS: Two schools where the students are generally viewed as disengaged have been involved since 2016. Foreign business communities have worked closely with teachers, and disengaged learners as an external feedback provider. The feedback design is based on the Double-loop Learning. The survey is used to assess the impacts of external feedback.

RESULTS: External feedback significantly contributes to more positive feeling on safety, belongingness, and happiness which is essential for learning and development. Based on the findings, external feedback helps overcome the feeling of disengagement in a human-centric environment.

CONCLUSIONS: The proper use of external feedback in a human-centric environment shows tangible benefits, especially when dealing with the disengaged learners. External feedback can help re-engage the disengaged learners which can lead to better learning and development.

Keywords: Human-centric environment, external feedback, disengaged learners, safe learning environment, learning and development

Introduction

Given the current business environment, the organizations need to ensure an effective human-centric environment which is essential for sustaining their learning capability [1, 2]. Typically, a human-centric environment indicates the explicit consideration of people' specific emotion, feeling, need, and want. This environment's effectiveness impacts learning and development [3]. Often, both workplace and school are used to examine the challenges facing a human-centric system [4, 5]. One of the most pressing issues for an effective human-centric environment is a failure to utilize the workforce's talents [6, 7]. In fact, it is now referred to as the eighth waste- unused talent which also include the untapped capability, skills, and knowledge from its workforce.

This waste is the major challenge for an organization to succeed in the era of Industry 4.0 [1,8,9]. The success in Industry 4.0 indicates that better utilization of the workers' talents, especially their ability to learn. Learning impacts an organization or a workplace on timely and successful adaptations to business and environmental challenges. This adaptation includes the ability to adjust, and to be continuously robust when faced with complex and wicked problems [1,10]. These problems are not often known and can arise without prior knowledge and notice. For instance, during the COVID-19 pandemic, many firms (e.g., SMEs as well as large firms in various industries such as travel and tourism, restaurants, etc.) have had to adapt due to a series of regulatory restrictions and a sudden change in a pattern of their customers.

The effectiveness of a human-centric environment depends on many factors [11,12]. Feeling of disengagement has often been cited as one of the most important contributors. Disengagement contributes to a lack of learning and development which indicates a failure to utilize the talents in a workplace [13,14]. Poor creativity and low innovation, and subsequently underperformance are the consequences of this disengagement [3,15]. It is important to point out that, in this study, the term learner is used to describe a worker in a workplace as well as a student at school.

Feeling of disengagement in a workplace or a school can be harmful for many reasons [16,17]. For a workplace, disengaged learners care less about their jobs than engaged ones. They put minimal effort and wait for instruction and guideline. They likely have more absenteeism and experience more workplace incidents. Disengaged learners are those who are not just unhappy at work but can purposely undermine the productivity of others [18]. At the present, based on Gallup, there are 20 million employees (making up approximately 18% of the American workforce) who are actively disengaged. Within the context of a school, the disengagement among the students has resulted in classroom disruption, dropout, bullying, poor school connectedness. Subsequently, this problem involves lower achievement and long-term social problems such as crime [18, 19]. Overcoming this disengagement is critical for a human-centric environment today.

To tackle the feeling of disengagement, traditional improvements and support have focused on more advanced technology adaptation, more clarity of chains of command, more flexible work schedule, better work-life balance, and more vigorous training programs [20, 21]. Despite strong commitment and efforts, many organizations have been unable to overcome this challenge. Imposing more rules and restrictions would not help reengage with the disengaged learners who feel hopeless and disconnected. Thus, a more humanistic approach such as a use of feedback from an external source provides strong potential with the possibility to understand its impacts on

learning and development. In a workplace or a school, external feedback includes the visitors from outside such as experts, colleagues, and peers who should have the shared interest in tackling the feeling of disengagement.

External feedback has strong potential to address the feeling of disengagement because it is viewed as less direct and more constructive. More importantly, feedback is not the same as assessment and evaluation so it is less threatening by nature and should entice more attention from the disengaged learners. This disengagement challenge becomes more serious when people are expected to constantly work with and learn collaboratively in a competitive environment as indicated by Industry 4.0 [6, 7, 9].

Problem Background and Statement

The feeling of disengagement is primarily caused by personal, family, and workplace-related factors [13, 22]. A lack of psychological safety within a human-centric environment is also one of the more serious factors. The term psychological safety describes a shared belief that the individuals can feel safe for expressing personal belief and ideas, asking for help, and embracing mistakes as opportunities to learn. Lack of meaningful feedback and futile relationships among the peers often contribute to this problem- fear of being embarrassed, punished, and reprimanded [6, 21, 23]. This issue becomes critical because psychological safety is not clearly visible at the beginning. Often, the prevention is too late when a problem occurs.

To tackle the feeling of disengagement in a human-centric environment, a workplace setting may not be suitable for a long-term experiment due to frequent changes of a workforce through promotion, transfer, departure, and dismissal [24]. Further, a longitude study is also needed to overcome the Hawthorne Effects. As a result, this study has adapted a school which largely resembles a workplace. The issues facing a typical workplace can be found in a school. These issues include social ladder in a school and social climbing in a workplace, school bullying and workplace harassment, and fear from being punished by teachers at school or fear of being reprimanded at work by supervisors [21, 25]. In a workplace or a classroom alike, lack of learning among the disengaged learners often results in disruptive behavior, underperformance, loss of productivity and creativity, absence and tardiness, and dropout or turnover.

In this study, the disengagement has been named as the primary contributor to the achievement gap between the two school categories- the schools that are part of the university teacher training and Ministry of Education schools and those belonging to local municipalities under Ministry of

Interior [26]. Bangkok Metropolitan Administration or BMA schools, part of Ministry of Interior, were established to offer education to the children of migrated workers who seek employment in Bangkok¹. Underachievement, laziness, lack of attention, refusal to learn, and disruptive behavior are some of the common misperceptions of students who attend Ministry of Interior schools [26]. Bullying and harassment as well as a serious lack of attention and engagement are also the description of poor learning environment at school. See Table 1 for the achievement gap.

[INSERT TABLE 1]

Objective

It is to assess the impacts of external feedback on learning and development. External feedback reflects an attempt to engage with the disengaged learners.

Method

The research process has three stages. This process is based on the collaboration with the schools which has taken place since 2016 (and is still ongoing). The first stage was the preparation for improvement interventions. The second stage focused on implementing various activities designed in the first stage. The third stage involved a survey to help assess the impacts from external feedback on the disengaged learners' learning and development. The details for each stage are as follows.

For this first stage, preparing a collaboration between an external entity (i.e., a foreign business community in Thailand, to be referred to as FBC) and two BMA schools was the primary task. The attention was on a possible change in science experiment (as part of an improvement in science education) based on the discussion with the teachers. The feeling of disengagement apparently began with poverty which had prevented almost all the students to further their education. Longer teaching hours, more challenging examinations, and more difficult assignments had not been able to help the disengaged learners develop or even motivate them to learn. It was deemed that science learning along with business and life skills would entice the attention from the disengaged students. This would lead to better learning and development.

¹ Note that there are two ministries responsible for basic education- Ministry of Education and Ministry of Interior. Local municipalities under Ministry of Interior are responsible for health and human services to local population which also includes education. Currently, about 15% of the student's population or 800,000 students in basic education are attending these schools. Included in this category is Bangkok Metropolitan Administration (BMA) which is administering 437 schools and is watching over 350,000 students.

Overcoming fear of learning (wrongly perceived to be refusal to learn) and disengagement feeling (wrongly perceived to be lazy) at school required a new way to engage: (1) behavioral engagement- active participation during academic activities, (2) emotional engagement- feeling of inclusiveness and belongingness, and (3) cognitive engagement- more ownership in learning by developing products from experiments. These engagements were incorporated into feedback design together with the Double-loop Learning [27]. Feedback from FBC (or external feedback) was to address two fundamental issues. They were: (1) 'what we do' or 'are we doing things right?' as the first loop, and (2) 'why we do what we do' or 'are we doing the right things?' as the second loop. FBC has strong interest in improving quality of learning due to the need for qualified workforce and is willing to collaborate with two BMA schools as an external feedback provider. See Figure 1.

[INSERT FIGURE 1]

Usually, the disengaged learners had primarily dealt with the teachers with the emphasis on academic achievement through formal assessments. No meaningful or significant interaction with an external entity ever materialized at both schools. This notion was taken seriously during the design of external feedback. For the first loop, the external feedback was to be more supportive and had no relationship with academic performance. It aimed to reassure, encourage, support, and validate the actions and changes by these disengaged learners. Thus, external feedback was to be constructive (to help encourage continuous changes that the disengaged learners tried to exhibit) and indirect (to avoid any misunderstanding with teachers).

It is important to note that constructive feedback represents supportive comments and positive suggestions that would contribute to a desirable outcome [28]. Appearance and visibility can be considered as non-verbal constructive. Constructive feedback should lead to a sense of reassurance by a person who received it. On the other hand, indirect feedback can reassure self-belief and improve confidence of a learner [29, 30]. Indirect feedback should encourage a learner to be creative and make self-corrections and share the similar role like constructive feedback [30].

For the second loop, it was essential to gain more insights into the prevailing mindsets of the disengaged learners. This sentiment was revealed during repeated interactions. Some of these sentiments are as follows. When I was born in a poor family, I would continue to be poor. When I was born without proper family background and connection, I would not have a good career and future. When I attended a BMA school, nobody outside a school would pay any attention to and

recognize my work. When I attended a BMA school, no matter how hard I try, I would not have an opportunity to succeed. These attitudes had prevented the disengaged learners from learning and development. External feedback in this second loop continued to be passive and non-verbal.

During the second stage, the implementation of the prepared tasks from the first stage was made. Note that the roles of a teacher would not be altered in terms of routine academic interactions, assessment and evaluation, and reporting. FBC would mainly complement the teachers and provided a supportive role to the disengaged learners. For science experiments, the focus was on product development instead of requiring the students to submit a report. Product development was to be emphasize outdoor activities which would allow the learners to interact and communicate when working in a team. Indoor experiments represented typically one-way communication between a teacher and a learner without much active communication among different learners.

For both BMA schools, outdoor experimented dealt with current water and air pollution which the learners were faced on the daily basis. These outdoor experiments would lead to products such as fertilizers from water hyacinth or from dry leaves which were frequently burned for disposal. Water hyacinth and dry leaves contributed to water and air pollution respectively. The sale of fertilizer could generate considerable incomes to the disengaged learners. Outdoor experiments provided countless opportunities to interaction and communication. This condition was deemed as necessity to create the sense of belongingness and enhance a safe learning environment.

For the third stage, the survey was adapted to assess the impacts from external feedback (to be refereed as the revised pedagogical practices). The survey's items focused on the critical issues relating to safe and appealing learning environment- adapting the questionnaire developed by Thailand's Office of Basic Education Commission together with Raks Thai Foundation- "Student Act to Stop Bullying in Schools and on Social Media." Statistical analyses would apply several tools and techniques to help interpret the perception of the participants- former and current learners who had taken part in the revised pedagogy since 2016. See Appendix A for the survey's details which consists of three parts. Also see Figure 2 for the study's framework.

[INSERT FIGURE 2]

Results

The key issues and results from the first two stages are as follows. During the interactions with the disengaged learners, it was clear that academic achievement and reprimand could not be used to entice their interests and motivate them to learn and develop. Thus, engaging with the learners who felt disenfranchised within a school was necessary. Despite FBC involvement as an external feedback provider, it could not interfere with regular academic work inside a classroom. Therefore, FBC had regularly organized workshops and training sessions, school visits, invitation for product display and sales, and financial and in-kind donations for product extension and improvement. These actions were viewed as an affirmation of support by FBC.

FBC sponsored the visits outside their respective school to help broaden the disengaged learners' horizon and paradigm. For instance, the disengaged learners understood that their future would not be determined by their family background and school. Just like fertilizer, despite being made of raw materials that were not wanted, it could be sold at a high price. External feedback focused on sense of hope and belief and demonstrates strong support and commitment to the changes that the disengaged learners has undertaken. See Appendix B for FBC activities.

For the survey, the total participants from the first and second BMA schools were 286 and 400 students, respectively. They represented the former and current students. Out of the total 686 survey participants, 204 students did not participate in the revised pedagogy with FBC's involvement while 482 students took part in the revised pedagogy which began in 2016. There were 280 male students and 406 female students participated in this survey. The surveys were completed during the academic year 2020-2021, and later statistically analyzed [31].

From the survey's overall results, the revised pedagogy (with the emphasis on external feedback) significantly contributed to more positive feeling of safety, belongingness, and happiness during the learners' time at school. Being outdoor, more interactions and communication, and a shared common goal from developing products from science experiments represented major changes which were initiated by FBC. A continuous engagement with FBC helped maintain the level of excitement and interests among the disengaged learners. The level of confidence, hope, belongingness, and quality of life apparently increased. See Table 2.

[INSERT TABLE 2]

In addition, the survey's overall findings show that the revised pedagogy significantly contributed to a decline in the perceived frequency on physical, verbal, and psychological bullying. A group's outdoor activities to develop a product for sale helped strengthen group communication and teamwork. Thus, sustained external feedback through continuous workshops, school visits, donations, invitations to display and sell products was instrumental for sense of belongingness and team building. The disengaged learners also felt that they could have bright future and career due to the skills learned from FBC's engagement and feedback. FBC's engagement also included the challenge into their paradigm about a lack of hope and opportunity due to their birth, family background, and school. External feedback highlighted that their birth alone would neither define nor predict their future. See Table 3.

[INSERT TABLE 3]

There is no significant impact on the perceived frequency of bullying by digital technology such as mobile phones, computers, and other digital devices. During the interactions with FBC, the application of digital instruments dealt primarily with online sales of the experiment's products. Proper use of these digital instruments was implicitly embedded during the workshops such as the term empathy, politeness, and respect to privacy and feeling. Although the overall results on this issue (so called cyberbullying) became less, this reduction was not statistically significant. Given the limited access (as very few owned personal notebooks and most used a prepared card to operate their mobile phone due to a lack of affordability for a monthly subscription), it is understandable that the issues relating to the impacts of external feedback on cyber bullying might not be viewed as significance among the disengaged learners.

[INSERT TABLE 4]

Discussion and Implications

It is certain that the disengaged learners were not necessarily unmotivated to develop or were incapable of learning. They felt disengaged because of a lack of meaningful interactions which reflected insufficient efforts to understand their needs. The design of the country's national curriculum has further accelerated this negative or dejected feeling since it primarily aimed to prepare the students for higher education. Thus, the challenging contents, vigorous assessments, and long classroom hours were not viewed as useful and beneficial. Moreover, the teachers were under the pressure to achieve a higher national examination score. As a result, the frustration became despair and led to disruptive and aggressive behavior [32].

After more than five years of continuous partnership in providing external feedback, it appears that the feeling of disengagement became less as shown in the perception of safer and more spirited learning environment. Feedback from an external source appears to positively affect the attitude and behavior of the disengaged learners. This notion is supported by the concept of informal learning in which feedback plays a very important role [28, 33]. External feedback from FBC has included verbal and gestural with no emphasis on a written aspect (to help differentiate between feedback and formal assessment). It is essential to recognize that FBC's process of providing external feedback was positive (i.e., constructive, and indirect) with the focus on sharing business experiences with the disengaged learners. This external feedback was based on individual needs [28, 29, 34].

Another important takeaway from the study is the design and delivery of feedback. Use of the Open- loop Learning as a design framework for external feedback appears to be helpful. This helps ensure feedback's effectiveness when receiving by the disengaged learners [35, 36]. This learning framework contributes to the need to recognize the roles of possible feedback providers (in addition to the teachers). During the design, a need to avoid overlapping information which can potentially create confusion among the receivers (i.e., the disengaged learners) and conflicts for the providers (i.e., teachers and FBC) was important. Clarity of the feedback (i.e., are we doing things right?) is essential for the perception of the disengaged learners [28, 30, 37].

The Double- loop Learning also contributes to the quality of feedback. The sensitivity of the feedback's receivers is needed [38]. This is the primary reason that FBC have had various tasks and activities- school visits, workshops, donations, sponsored trips, invitations to display and sell products, etc. This variety was viewed by the disengaged learners as endorsement, sincerity, and encouragement which were missing throughout their school experiences. Specifically, for the second loop (i.e., why we do what we do?), external feedback cannot be too passive but needs to consider the paradigm of the disengaged learners. This can help sway the prevalent paradigm which influences the disengaged learners' actions (whether they paid the attention to a lesson, they interacted and worked with their peers, etc.)

For the implication, it appears that external feedback potentially helps overcome the feeling of disengagement in a human-centric environment. External feedback indicates effective engagement from an external entity. This engagement is essential for learning and development of the individuals in a workplace or a school. External feedback also helps create and ensure safe environment which is the foundation for reengaging with the disengaged learners. In this

study, external feedback has altered the mindset, attitude, and behavior of the learners who feel disengaged with a school.

Instead of more rules and enforcement, dealing with disengagement at school can explore further on the roles of feedback, especially its nature (i.e., constructive, and indirect) and delivery (i.e., by an external entity). Overcoming the fear of learning brings drastic changes in how these learners receive and learn the lessons [8, 39]. Having continuous feedback based on active engagement from an external entity can certainly entice the interests of the disengaged learners [33, 34].

Also, there is a clear linkage between more effective feedback stemmed from active engagement and safer learning environment which is essential for a human-centric system development. Feeling safe at school is important for learning and development and simply cannot be successfully achieved without continuous engagement [14, 21]. In general, external feedback, if consistently provided with trust and empathy during design, can help reengage the disengaged learners in a human-centric environment. Reengaging with disengaged learners can contribute a more productive human-centric environment which is critical for any organization or entity today in an era of Industry 4.0.

Finally, trust was also considered to be significant for successful engagements. This is due to the nature of the underprivileged background of the disengaged learners. During the interactions, building this trust required strong commitment and persistency which FBC was willing to provide. One project, one visit, or one meeting would not be sufficient. FBC activities dealt with career opportunity and recognition through business experiences.

The study not only highlights the impacts of external feedback on the mindset and behavior of the disengaged learners but also points to the potential benefits of informal learning. Informal learning is the foundation of the development of a human-centric system such as a workplace or a school [14, 19, 21]. Overcoming the disengagement is importance since carelessness, tardiness, and absenteeism can be prevented. Usually, a disengaged person doesn't cause problems at first, but can become more argumentative and disruptive over time. Feedback can possibly play an important role for this prevention.

Conclusion

FBC, as an external entity, had used feedback to reengage with the disengaged learners from two BMS schools. External feedback helped entice the interests in learning since many disengaged learners felt neglected and left behind. Several activities undertaken by FBC highlighted the use of constructive and indirect feedback for engagement with these learners. The design of external feedback was based on the Double-loop Learning. Moreover, external feedback helped tackle school-related factors such as negative relationships with teachers, abusive behavior or bullying by peers, unsupportive learning culture and environment, and lack of empathy.

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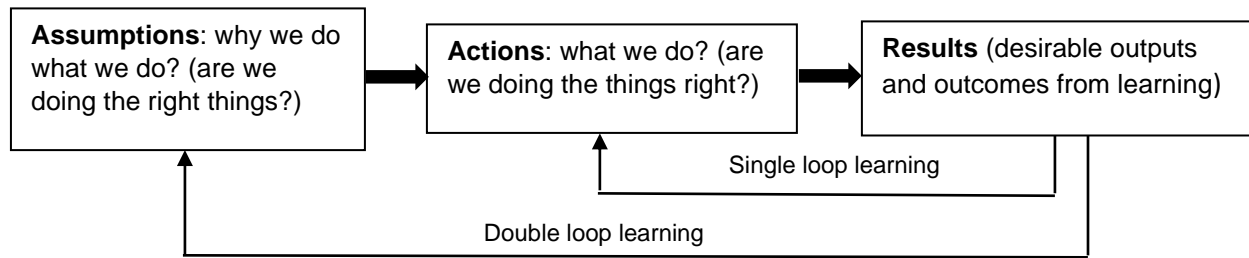
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Table 1: the 2011 Score from Trends in International Mathematics and Science Study

School Category	Science	Mathematics
University Teacher Training (Demonstration or Laboratory) Schools	552	554
Ministry of Education Schools (only public school)	472	460
<i>BMA Schools (part of the special administration under Ministry of Interior)</i>	<i>447</i>	<i>425</i>

Source: Department of Education, BMA



Note: This study integrates the feedback from an external entity to strengthen both loops instead of relying solely on the teachers.

Figure 1: Use of the Open- loop Learning for the Development of External Feedback
(Adapted from Argyris, 1991)

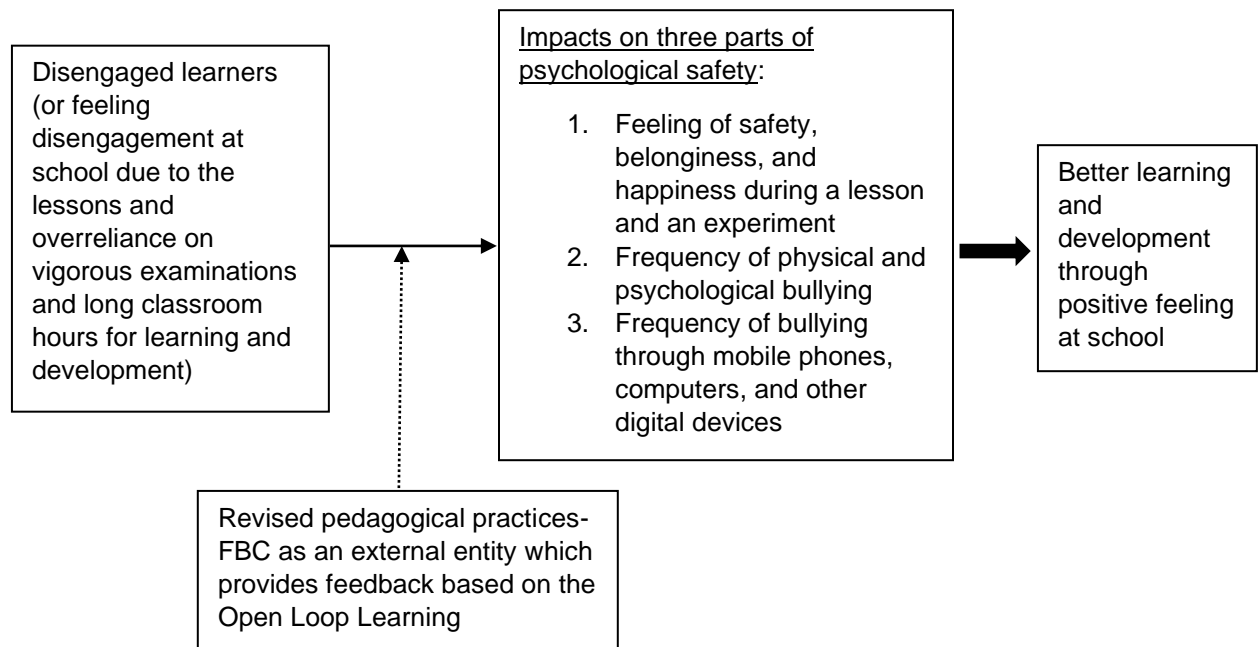


Figure 2: Research Framework

Table 2: Safety, Belongingness, and Happiness during a Lesson/ experiment and at School

Circumstance facing you during lectures/ experiments and at school	Regular Pedagogy n = 204		Revised Pedagogy n = 482		t-test
	Average Value	S.D	Average Value	S.D	
[1] I am happy with my work and activities so that I forget about time.	2.35	0.801	2.37	0.834	-0.309
[2] I can concentrate with assignments and tasks.	2.11	0.689	2.31	0.736	-3.342*
[3] If I intend to complete my assignment and task, I can complete it.	2.65	0.889	2.76	0.886	-1.478
[4] I feel that I reach my personal goals.	2.56	0.942	2.86	0.992	-3.701*
[5] I am energized and enthusiastic to begin a day.	2.29	0.836	2.59	0.899	-4.170*
[6] I often feel that I can tell good things that have happened to me to friends.	2.62	1.041	2.90	1.151	-2.928*
[7] When I am faced with a problem, I have friends with me.	2.52	1.010	2.77	1.064	-2.880*
[8] I feel that friends are genuinely concerned about my well-being.	2.61	1.070	2.85	1.097	-2.570*
[9] I feel cheerful and often laugh easily.	2.85	1.079	3.15	1.110	-3.322*
[10] I have positive outlook with my life.	2.55	1.028	2.82	1.094	-3.004*
Overall Results	2.51	0.607	2.74	0.663	-4.34*

Note: * Significance at the 0.05 level

Table 3: Frequency of Physical, Verbal, and Psychological Bullying

Circumstance facing you during lectures/ experiments and at school	Regular Pedagogy n = 204		Revised Pedagogy n = 482		t-test
	Average Value	S.D	Average Value	S.D	
[1] I am verbally abused, ridiculed, and harassed which contribute to my despair during a lesson.	2.38	1.187	2.06	1.006	2.294*
[2] I am ignored and prevented from class discussion, group participation, and play.	1.48	0.803	1.40	0.709	1.184
[3] I am physically attacked or am isolated in a room.	1.45	0.855	1.34	0.724	1.579
[4] Somebody makes up a story or a rumor about me and tries to spread it to others.	1.44	0.723	1.44	0.722	0.01
[5] I have money or personal belongings taken or stolen from me.	1.46	0.704	1.42	0.754	0.687
[6] I am harassed or am forced to perform a task against my will.	1.37	0.780	1.33	0.733	0.639
[7] I am verbally abused or ridiculed due to my appearance, sexual preference, academic ability which contribute to my reluctance to go to school.	1.90	1.184	1.54	0.818	2.901*
Overall Results	1.61	0.566	1.50	0.560	2.282*

Note: * Significance at the 0.05 level

Table 4: Frequency of Bullying through Mobile Phones, Computers, and Other Digital Devices

Circumstance facing you during lectures/ experiments and at school	Regular Pedagogy n = 204		Revised Pedagogy n = 482		t-test
	Average Value	S.D	Average Value	S.D	
[1] I have experienced cyber bullying.	1.29	0.667	1.30	0.672	-0.393
[2] Somebody makes fun of me and my name and spread this through online.	1.34	0.620	1.29	0.637	0.998
[3] Somebody uses a photo and creates a rumor about me, and spread this through online.	1.13	0.418	1.14	0.506	-0.887
[4] I have been intimidated or threatened through online.	1.20	0.615	1.14	0.424	1.270
[5] I have been removed from a social or online group without my consent and have been prevented from joining.	1.26	0.609	1.20	0.571	1.119
[6] Somebody has fabricated my identity which causes defamation and degradation.	1.15	0.580	1.13	0.451	0.566
[7] Somebody has stolen my password and share confidential information which results in personal embarrassment and humiliation.	1.24	0.609	1.15	0.474	1.858*
Overall Results	1.23	0.466	1.19	0.396	

Note: * Significance at the 0.05 level

Appendix A: Description of the Survey

The survey applies the 5-point Likert Scale. The survey focuses on three main issues. The first part (from Items 1.1 to 1.10) deals with feeling of safety, belongingness, and happiness during a lesson and an experiment. The 'almost always' category corresponds to the score 5. The 'never' category is assigned the score of 0. The second issue (from Items 2.1- 2.7) is about the frequency of physical and psychological bullying. The '3-4 times a week on average' category corresponds to the score of 5. The 'never' category is denoted the score of 0. The third issue (from Items 3.1- 3.7) copes with the frequency of bullying through mobile phones, computers, and other digital devices. The 'more than 10 times a month on average' category corresponds to the score of 5. The 'never' category is denoted the score of 0. To test and confirm the reliability of the survey, the use of Internal Consistency Method and the alpha coefficient (Cronbach's alpha) were applied.

Select the most applicable description that you have faced during the past semester.

Issue 1: Feeling of safety, belongingness, and happiness during a lesson/ experiment and at school.

Circumstance facing you during lectures/ experiments and at school	Never	Sometimes	Often	Very Often	Almost Always
[1.1] I am happy with my work and activities so that I forget about time.	1	2	3	4	5
[1.2] I can concentrate with assignments and tasks.	1	2	3	4	5
[1.3] If I intend to complete my assignment and task, I can complete it.	1	2	3	4	5
[1.4] I feel that I reach my personal goals.	1	2	3	4	5
[1.5] I am energized and enthusiastic to begin a day.	1	2	3	4	5
[1.6] I often feel that I can tell good things that have happened to me to friends.	1	2	3	4	5
[1.7] When I am faced with a problem, I have friends with me.	1	2	3	4	5
[1.8] I feel that friends are genuinely concerned about my well-being.	1	2	3	4	5
[1.9] I feel cheerful and often laugh easily.	1	2	3	4	5
[1.10] I have positive outlook with my life.	1	2	3	4	5

Issue 2: Frequency of physical, verbal, and psychological bullying

Circumstance facing you during lectures / experiments and at school	Never	Happened 1-2 times	Happened 2-3 times a month	Once a week	Happened 3-4 times a week
[2.1] I am verbally abused, ridiculed, and harassed which contribute to my despair during a lesson.	1	2	3	4	5
[2.2] I am ignored and prevented from class discussion, group participation, and play.	1	2	3	4	5
[2.3] I am physically attacked or am isolated in a room.	1	2	3	4	5
[2.4] Somebody makes up a story or a rumor about me and tries to spread it to others.	1	2	3	4	5

[2.5] I have money or personal belongings taken or stolen from me.	1	2	3	4	5
[2.6] I am harassed or am forced to perform a task against my will.	1	2	3	4	5
[2.7] I am verbally abused or ridiculed due to my appearance, sexual preference, academic ability which contribute to my reluctance to go to school.	1	2	3	4	5

Issue 3: Frequency of bullying through mobile phones, computers, and other digital devices

Circumstance facing you during lectures / experiments and at school	Never	Happened 1-2 times	Happened 2-3 times a month	Once a week	Happened 3-4 times a week
[3.1] I have experienced cyber bullying.	1	2	3	4	5
[3.2] Somebody makes fun of me and my name and spread this through online.	1	2	3	4	5
[3.3] Somebody uses a photo and creates a rumor about me, and spread this through online.	1	2	3	4	5
[3.4] I have been intimidated or threatened through online.	1	2	3	4	5
[3.5] I have been removed from a social or online group without my consent and have been prevented from joining.	1	2	3	4	5
[3.6] Somebody has fabricated my identity which causes defamation and degradation.	1	2	3	4	5
[3.7] Somebody has stolen my password and share confidential information which results in personal embarrassment and humiliation.	1	2	3	4	5

To evaluate the findings, the analysis would adapt the frequency based on the interval of 0.8. This was calculated from $(5-1)/5$ which is equivalent to 0.8. The description is as follows. The average value between 4.21- 5.00 reflects the feeling of the least safe or happiness which is due to the highest frequency level of being bullied. The next level is the average value between 3.41- 4.20 which reflect the feeling of less safe and happiness due to the high frequency of being bullied. The next three levels are between 2.61- 3.40, 1.81 to 2.60, and 1.00- 1.80. For the average value of 1.00-1.80 reflect the feeling of safe and happiness because a student does not experience any forms of bullying.

To determine the sample size for the survey, the study applies the approach by Yamane (1973). This is due to the specific size of the students from both schools. The first school has 798 students while the second school has 1,541 students. Therefore, for the first school, the minimum participants are 267 students, $[798/ (1+798(0.05^2))]$. For the second school, the minimum participants are 318 students. The total participants from both schools are 286 and 400 students, respectively.

Appendix B: Description of FBC Activities Which Correspond to the Single and Second Loops

FBC has been working closely with the teachers in redesigning pedagogical practices which focus on integrating the hand-on, simple, and practical approach since 2016. Experiments learning on the study of soil and water was the initial focus. Together with the teachers, FBC had highlighted the use of products (e.g., new product development) to reflect the understanding of science topics instead of coming up with the experiment's reports. FBC has adapted the following approach.

- Use of products as a primary output from science experiment (instead of a report) reflected a common need for the disengaged learners who needed extra income and would allow them to conduct hands-on experiments (instead of only reading from a text or a manual).
- Use of products increased interaction, communication, and opportunities to know each other which could address the concerns on physical and psychological safety.
- Use of products allowed FBC to continuously engage with teachers and students as an external feedback provider.

FBC attempted to provide external feedback which was constructive such as training and workshops, visits, in-kind and financial donation for product extension and improvement, and purchase of products. These activities demonstrated the recognition of the students' efforts in improving their science skills and reflect the attempt to address the first loop within Double-loop Learning (Argyris, 1991).



For the second loop, FBC continuously sponsored an event or engaged with the embassies to help with product promotion. An invitation to display and sell the products was viewed positively by the disengaged learners as an opportunity to showcase their hard work. FBC also arranged and financed peer-learning activities between two BMA schools. In addition, FBC financially supported the trip for the disengaged learners to visit a successful social enterprise which produces fertilizer from water hyacinth and vermicompost. This trip challenged the prevailing paradigm of the disengaged learners. Fertilizer from waste represented a product that was based on unwanted materials. However, this enterprise had successfully earned a great deal of income from this product and was highly regarded at both provincial and regional levels. This scenario illustrated to the disengaged learners that no matter how poor they were, they could be successful.

