

RESEARCH BRIEF

A Causal Relationship Model of Thai Students Disciplined Minds

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According to Williams and Williams (2011) creating an emotionally literate environment includes equipping students with essential life skills. Well-being or life satisfaction is the degree to which a student is content with his or her life including pleasure in daily activities, meaningfulness of life, the goodness of fit between desired and achieved goals, mood, self-concept, perceived health, financial security, and social contact. According to UNICEF (2000), in all countries, quality content should include several pivotal areas including literacy, numeracy, and life skills.

Disciplined Mind Learners

In Fryer's (2007) discussion about Gardner's (2007a; 2007b) "5 minds" and what it takes to develop an ethical mind-set. The five minds discussed the disciplined mind, the synthesizing mind, the creating mind, the respectful mind, and finally the ethical mind.

Specifically, the disciplined mind was stated to be what we gain through applying ourselves in a disciplined way in school which eventually leads to our professional expertise. It is our ability to master information and is not simply knowing a particular subject. According to Young (2006), learning to think the way experts think is a skill which should be developed by the end of secondary school (Young, 2006).

As stated in the "Distance" (2016) article, successful online learning requires students to be self-directed, self-motivated, and self-disciplined. This is consistent with the research from Duckworth and Seligman (2005), which indicated that self-discipline outdoes IQ in predicting academic performance of adolescents. Roper (2007) also identified seven successful tips for online students and indicated that the most important was the student's ability to develop a time-management strategy to help manage course requirements as an independent learner. Therefore, students that have a disciplined mind are far more likely to succeed in a technologically advanced environment where independence is part of the education environment's criteria (Dille & Mezack, 1991).

Trilling and Fadel (2009) indicated that collaborative work required the ability to assume shared responsibility and value individual contributions made by each team member. Communication and collaboration skills can be learned through a variety of methods (e.g., project-based learning, problem-based learning, and design-based learning). Digital literacy and the associated skills are thus becoming the basic and essential skill set of any employee that wishes to survive in a highly competitive world (Phuapan, Viriyavejakul, & Pimdee, 2016). Also, research on teaching communication and collaboration skills encourages direct and mediated

communication, working with others on team projects, and performance-based learning and assessment (Partnership for 21st Century Learning, 2009; Reeve, 2016).

Life Skills

The World Health Organization (WHO) has defined life skills as “the abilities for adaptive and positive behavior that enable individuals to deal effectively with the demands and challenges of everyday life” (Seth, n.d.). From the four “pillars of learning” as outlined by Delors (1996), life skills are seen as personal management and social skills necessary for functioning on an independent basis and it covers learning how to do, learning to do, learning to be, and learning to live together (Nan-Zhao, 2009).

Liao and Lin (2011) discussed student self-learning management as it was applied within a virtual learning environment (also referred to as a learning management system or LMS) by using Moodle and determined that online discussions stimulated student creativity. This is consistent with the study of Hashemyolia, Asmuni, Daud, Ayub, and Shah (2014), which indicated that student participation predicts student academic achievement with students who use LMS having the ability to communicate effectively. Individual students select, manage, and assess their own learning and development activities, which can be measured or pursued at any time, in any place, through any means, at any age.

Self-Concept

According to Mann, Hosman, Schaalma, and de Vries (2004), self-esteem can lead to better health and social behavior, and that poor self-esteem is associated with a broad range of mental disorders and social problems.

Teacher Classroom Management

According to Marzano and Marzanoe (2003), one of the classroom teacher’s most important jobs is managing the classroom effectively. Teachers’ actions in their classrooms have twice the impact on student achievement as do school policies regarding curriculum, assessment, staff collegiality, and community involvement.

This is consistent with a comprehensive literature review by Wang, Haertel, and Walberg (1993), which demonstrated the importance of effective classroom management. From the research collected from 86 chapters of annual research reviews, 44 handbook chapters, 20 government and commissioned reports, and 11 journal articles, Wang et al. (1993) produced a list of 228 variables affecting student achievement. The findings from the 134 separate meta-analyses clearly showed that classroom management had the largest effect on student achievement.

A review of the literature and academic studies has led to the determination of the factors and importance of the students’ disciplined mind, their life-skills, their self-concept, and the necessity for the teacher’s classroom management skills as outlined in the following five hypotheses.

- H1: Self-Concept (SC) has a direct and positive influence on a Disciplined Mind (DM).
- H2: Self-Concept (SC) has a direct and positive influence on Life Skills (LS).
- H3: Teacher Classroom Management (TCM) has a direct and positive influence on Life Skills (LS).
- H4: Teacher Classroom Management (TCM) has an indirect and positive influence on a Disciplined Mind (DM).
- H5: Life Skills (LS) has an indirect and positive influence on a Disciplined Mind (DM).

Methods

Evans (2013) analyzed 460 articles on assessment feedback in higher education over a 12-year period and discussed the importance of authentic and performance assessment. For integrated scientific process skills, Martin, Sexton, Franklin, Gerlovich, and McElroy (2005) and Padilla (1990), referred to five required skills including formulating hypotheses, defining operationally, identifying and controlling variables, experimenting, and interpreting and making inferences. Therefore, the following methods are presented.

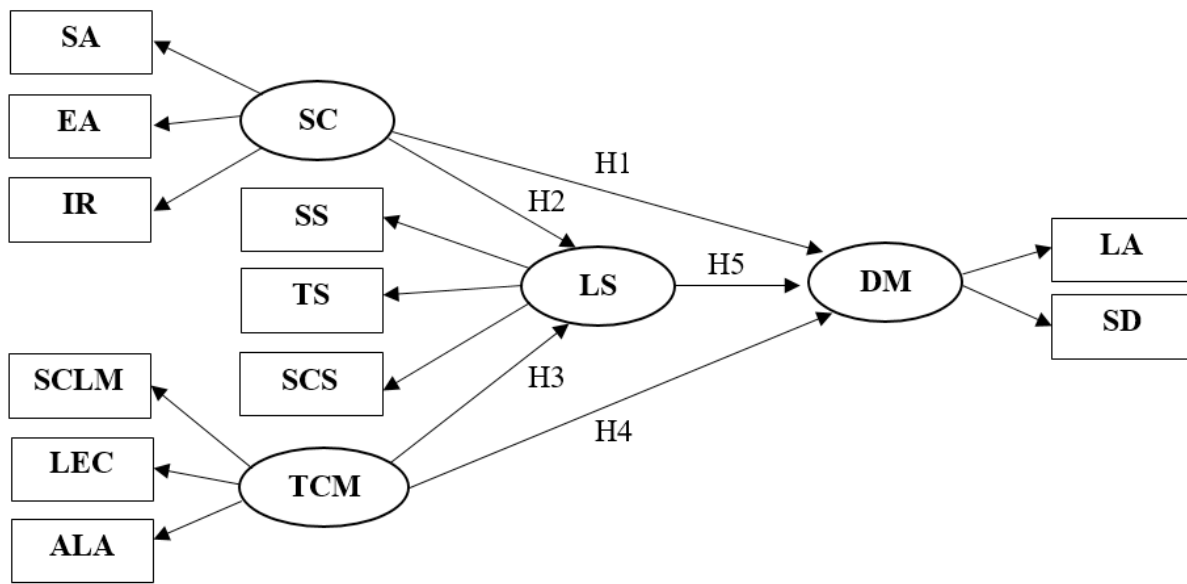


Figure 1. Conceptual model of a Thai student’s disciplined mind.

Population and Sample

The population in this study was 260,283 students enrolled in 119 lower and upper secondary schools (junior and senior high schools) located within Bangkok’s Educational Service Area Office Zone 1 and 2 in 2013. A multistage random sample was constructed by taking a series of simple random samples in stages from both the 119 lower and upper secondary schools.

This type of sampling is often more practical than simple random sampling for studies requiring “on location” analysis such as this study (Rahmantya, 2009). From it, 932 students were identified and surveyed. The sample size was thereupon validated using Yamane’s (1973) formula (while allowing for a 4.5% error rate), where n is the sample size, N is the population size, and e is the level of precision.

$$n = N / [1 + N (e)^2]$$

Table 1
Summary of Latent and Observed Variables and Their Associated References

Latent Variables	Observed Variables (11 Items)
Disciplined Mind (DM)	learning ability (LA) self-discipline (SD)
Life-Skills (LS)	social skills (SS) thinking skills (TS) stress coping skills (SCS)
Self-Concept (SC)	self-awareness (SA) emotional adjustment (EA) interpersonal relationships (IR)
Teacher Classroom Management (TCM)	student centered learning management (SCLM) learning environment creation (LEC) authentic learning assessment (ALA).

Research Tools

A questionnaire was used to collect data from the 932 students through multi-stage random sampling. The questionnaire items were designed using a 5-point Likert type agreement scale (Likert, 1967). The reliability of the questionnaire was determined to ensure that the responses collected through the instrument were reliable and consistent. The reliability value of 0.81 to 0.88 was calculated on the latent variables disciplined mind, life-skills, self-concept, and teacher classroom management (TCM) by using Cronbach's alpha (Cronbach, 1990) to ensure whether there was internal consistency within the items. The questionnaire was then used to evaluate the disciplined mind of the students, which the scales being defined as follows: 1 = Very low, 2 = Low, 3 = Medium, 4 = High, and 5 = Very high.

Results

Table 2 shows the results from the respondent's questionnaire response concerning their personal information. As expected, there were slightly more girls (52.47%) than boys (47.53%), which is most likely explained by the fact that many boys opt for vocational education paths in their later high school years.

Confirmatory Factor Analysis (CFA)

The researchers specified the CFA model (Hox & Bechger, 1998) where DM learners were influenced by learning ability and self-discipline. The variables for DM factor loading are 0.45 and 0.71, respectively, with both variables are statistically significant at the 0.05 level. The root mean square error of approximation

Table 2
Respondent's Characteristics

Questionnaire Item	Number	%
Sex		
Male	443	47.53
Female	489	52.47
Total	932	100.00
Bangkok Education Service Area Office		
<i>Service Area Office 1</i>	487	52.25
<i>Service Area Office 2</i>	445	47.75
Total	932	100.00
Student's Grade		
Grade 7	47	5.04
Grade 8	123	13.20
Grade 9	205	22.00
Grade 10	204	21.89
Grade 11	183	19.64
Grade 12	170	18.24
Total	932	100.00

(RMSEA), which measures the discrepancy per degrees of freedom (df), was also reported at 0.000 for DM. RMSEA values range from 0 to 1, with a smaller RMSEA value indicating better model fit. The acceptable model fit is indicated by an RMSEA value if less than or equal to 0.06 (Hu & Bentler, 1999).

The *p* value is also a descriptive statistic, which ranges in value from 0 and 1. DM was determined to be 0.87, which is a large *p* value (> 0.05), indicating weak evidence against the null hypothesis. Researchers have stated that a Cronbach’s alpha (α) value greater than 0.70 is also reliable, which for the study, the α value for DM was calculated at 0.02, thus, is considered a good model fit (Hair, Black, Black, Babin, & Anderson, 2006; Nunnally, 1978).

LS was determined to be influenced by social skills (SS), thinking skills (TS), and stress coping skills

(SCS) as indicated by the standard loading scores of 0.79, 0.90, and 0.78, respectively (Table 3). All the variables were also statistically significant at the 0.05 level.

SC was also influenced by self-awareness (SA), emotional adjustment (EA), and interpersonal relationships (IR) as indicated by the standard loading scores of 0.85, 0.51, and 0.85, respectively. All the variables are statistically significant at the 0.05 level.

TCM was influenced by student centered learning management (SCLM), learning environment creation (LEC), and authentic learning assessment (ALA) as indicated by the standard loading scores of 0.82, 0.87, and 0.64, respectively. All the variables are statistically significant at the 0.05 level.

The level of influence of each of the variables is shown in Table 4. Results show that SC and TCM had

Table 3
CFA results for Disciplined Mind, Life-Skills, Self-Concept, and Teacher Classroom Management

Latent Variables	Observed Variables	Factor Loading
1. Disciplined Mind (DM)	Learning Ability (LA)	0.45*
	Self-Discipline (SD)	0.71*
2. Life-Skills (LS)	Social Skills (SS)	0.79*
	Thinking Skills (TS)	0.90*
	Stress Coping Skills (SCS)	0.78*
3. Self-Concept (SC)	Self-Awareness (SA)	0.85*
	Emotional Adjustment (EA)	0.51*
	Interpersonal Relationships (IR)	0.85*
4. Teacher Classroom Management (TCM)	Student Centered Learning Management (SCLM)	0.82*
	Learning Environment Creation (LEC)	0.87*
	Authentic learning Assessment (ALA)	0.64*

Note: *p* < 0.05

Table 4
Direct Effect (DE), Indirect Effect (IE), and Total Effect (TE) of Variables

Causal variable	Variable Effect					
	Life Skills			Disciplined Mind		
	DE	IE	TE	DE	IE	TE
Life Skills (LS)	-	-	-	0.67*	-	0.67*
Self-Concept (SC)	0.65*	-	0.65*	0.16*	0.42*	0.58*
Teacher Classroom Management (TCM)	0.26*	-	0.26*	0.04	0.17*	0.21*
R ²	0.70			0.74		

a direct effect on LS as the results were statistically significant at the 0.05 level. Furthermore, the coefficient of influence was calculated at 0.65 and at 0.26, respectively, with the causal variables explaining LS at 70%. LS and SC also were shown to have a direct effect on DM which was statistically significant at the 0.05 level. Additionally, the coefficients of influence were 0.67 and 0.16, respectively. SC and TCM also showed an indirect effect on DM through LS, which was also statistically significant at 0.05 level. Finally, the coefficients of influence were SC = 0.42 and

TCM = 0.17, with the causal variables together explaining DM at 74%.

Table 5 and Figure 2 present the final results of the study concerning a student’s disciplined mind.

Table 6 shows the mean (\bar{x}) and the standard deviation (S.D.) of the latent and observed variables. From it we can see that all items were ranked as “good,” with the latent variable of DM having the highest score with a $\bar{x} = 3.36$. This was followed by TCM with a $\bar{x} = 3.04$, and LS and SC both with a $\bar{x} = 3.02$.

Table 5
Hypotheses Testing Results

Hypotheses	Coef.	Result
H1: Self-Concept has a direct and positive influence on Disciplined Mind.	0.16*	accept
H2: Self-Concept has a direct and positive influence on Life Skills.	0.65*	accept
H3: Teacher Classroom Management has a direct and positive influence on Life Skills.	0.26*	accept
H4: Teacher Classroom Management has an indirect and positive influence on Disciplined Mind.	0.04	reject
H5: Life Skills has an indirect and positive influence on Disciplined Mind.	0.67*	accept

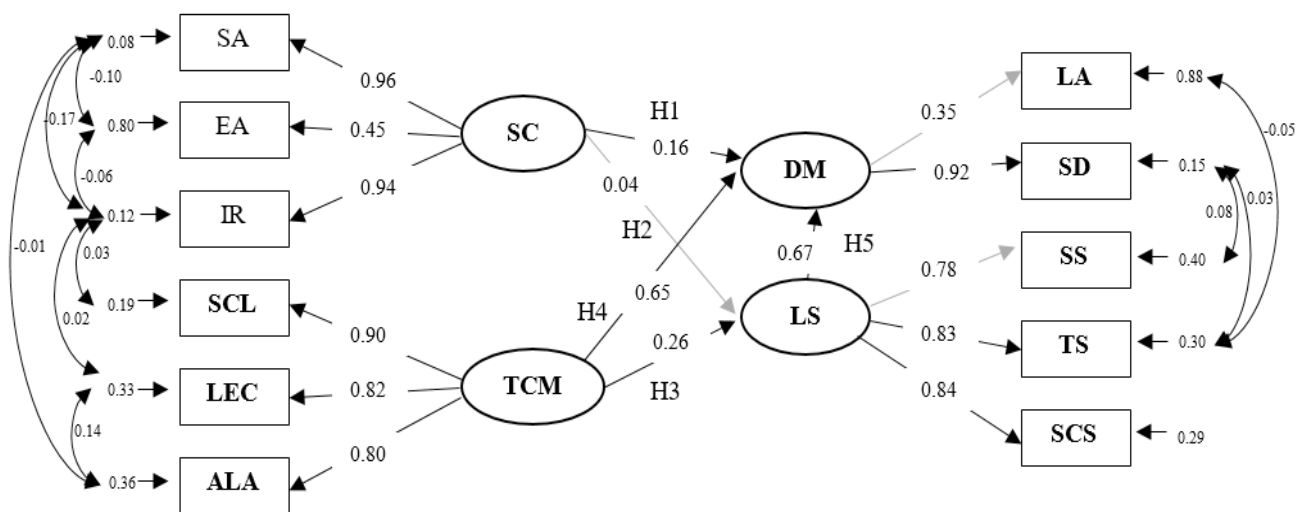


Figure 2. Final SEM model.
 Note: Chi-square = 12.15, df = 18, p value = 0.84, RMSEA = 0.000.

Table 6*The \bar{x} , S.D., and Interpretation of the Variable's Questionnaire Results*

Latent variable	\bar{x}	S.D.	Level
Disciplined Mind (DM)	3.36	.54	Good
learning ability (LA)	3.25	.63	Good
self-discipline (SD)	3.00	.39	Good
Life Skills (LS)	3.02	.40	Good
social skills (SS)	2.88	.46	Good
thinking skills (TS)	3.07	.46	Good
stress coping skills (SCS)	3.12	.43	Good
Self-Concept (SC)	3.02	.43	Good
self-awareness (SA)	3.08	.44	Good
emotional adjustment (EA)	2.99	.55	Good
interpersonal relationships (IR)	3.02	.47	Good
Teacher Classroom Management (TCM)	3.04	.44	Good
student centered learning management (SCLM)	3.03	.48	Good
learning environment creation (LEC)	3.03	.49	Good
authentic learning assessment (ALA)	3.05	.47	Good
Total	3.11	.45	Good

Discussion

The results of this study identified the following elements:

Disciplined Mind (DM)

A student's DM was determined to be affected by LA (0.45) and SD (0.71) with a student's DM leading to the ability to become an expert in any particular subject, which can later be applied to work and to life (Gardner, 2007a). Furthermore, Gardner suggested that a disciplined mind required four steps which included the student focusing on the important concepts within the discipline being learned, spending time and diving into the details of the topic, approaching topics in a variety of ways, and finally teachers should allow for the demonstration of the knowledge learned. DM learners are thus lifelong learners.

Zimmerman (2002) indicated that studies have clearly revealed how self-regulatory processes lead to success in school (but few teachers prepare students to learn on their own), with students who set specific

and proximal goals for themselves displaying superior achievement and perceptions of personal efficacy. Self-regulation of learning today involves more than detailed knowledge of a skill; it involves the self-awareness, self-motivation, and behavioral skill to implement that knowledge appropriately, which leads to lifelong learning.

Wolf (2007) documented the convergence between information literacy and self-regulation, indicating that students who master high levels of self-regulation are able to adapt to different and difficult learning situations, having the ability to change learning strategies when necessary. Setting specific goals and finished the desired tasks are also valued traits for self-regulated DM students.

Bloom, Engelhart, Furst, Hill, and Krathwohl (1956) demonstrated decades ago that most teachings tended to be focused on fact-transfer and information recall—the lowest level of training—rather than true meaningful personal development. This remains a central challenge for educators and trainers in modern times. Bloom et al.'s taxonomy (structure) model

consisted of three parts, or “overlapping domains” and although Bloom et al. used rather academic language, the meanings are simple to understand as outlined below:

- Cognitive domain (intellectual capability, knowledge, or “think”)
- Affective domain (feelings, emotions, behavior, attitude, or “feel”)
- Psychomotor domain (manual and physical skills, i. e., skills, or “do”)

From the research, a student’s DM was determined to be affected positively by learning ability and self-discipline.

Life Skills (LS)

From the research, the student’s LS was determined to be affected by social skills (SS = 0.79), thinking skills (TS = 0.90), and stress coping skills (SCS = 0.78). This is consistent with Barone, Aguirre-Deandreis, and Trickett (1991) which also assessed the students’ life-skills as their social skills, their thinking skills, and their ability to deal with stress.

This is also consistent with Thailand’s national policies on education which view human capacity development as focusing on providing children and youth with a firm foundation for attaining morality and public-mindedness, together with capacities, skills, and basic knowledge essential to their future lives, leading to sustainability in national development (The Ministry of Education Thailand, 2008).

Self-Concept (SC)

From the research, students’ SC was determined to be affected by three observed variables including self-awareness (SA = 0.85), emotional adjustment (EA = 0.51), and interpersonal relationships (IR = 0.85). This is consistent with Eccles (1999) which reported that the key psychological challenges that mark the middle-childhood years are self-awareness, social comparison, and self-esteem; and according to Coopersmith (1967), self-esteem is a personal judgment of the worthiness that is expressed in the attitudes the individual holds towards himself. Baumeister (1998) went on to further elaborate that self-esteem is the evaluative aspect of

the self-concept that corresponds to an overall view of the self as worthy or unworthy.

Teacher Classroom Management (TCM)

From the research, TCM was determined to be affected by three observed variables: student-centered learning management (SCLM = 0.82), learning environment creation (LEC = 0.87), and authentic learning assessment (ALA = 0.64).

In the traditional classroom, the first area that makes a noticeable impact on student success is the physical environment of the classroom (Hannah, 2013; Grubaugh & Houston, 1990). Desks in straight rows and blank walls do not leave good first impressions about the atmosphere for learning. The way in which a teacher organizes their class, or how they control it, will yield positive or negative consequences for their students (Hannah, 2013). In Thailand, O’Sullivan (2006) expressed that the classroom environment is crucial for the quality of the Thai education system. This is consistent with other Thai research by Wongvanakit (n.d.), which determined that the design of university classrooms significantly affects the participants’ preference for the course and attitude on learning performance.

According to Motschnig-Pitrik and Holzinger (2002), “student-centered teaching” is more demanding in terms of communication, organization, as well as the provisioning of learning materials. The extra effort however of the “pure” student-centered approach is well justified and documented as can be seen from numerous well-documented case studies from scholars such as Rogers (1983).

Student-centered learning management also focuses on the concept of teaching students to create new knowledge and as part of this, cognitive learning is involved with concept learning and problem-solving. Teachers are no longer strictly experts but act as tutors who accompany the learners during the learning process and support them in active problem-solving.

According to the group Education Scotland (n.d.), mental, emotional, social, and physical wellbeing are essential within all learning communities and must be fostered for successful learning. And according to Guptaeswar (2014), the teacher should act as the facilitator in the process to achieve eventual success

with physical and emotional wellbeing being the cornerstone for all learning in the early years and even afterward.

In Thailand, health education in schools is promoted under the idea of “a state of perfect happiness” which is achieved through four dimensions including physical, mental, social, and intellectual (Erawan, 2015). The Thai Health Promotion Foundation (2003) developed a new definition of health that is comprised of a comprehensive and integrated health, which consists of physical, mental, social, and spiritual health, with their dimensions of lifestyle interconnected and interrelated in human relationships, with the physical and social environment.

Conclusion

The latent variable of a student’s disciplined mind was shown to have a crucial role in the development of student learning and was positively affected by the observed variables, learning ability and self-discipline. A disciplined mind contributes to the potential access to knowledge and learning and the expressive behavior that is indicative of the ability to learn.

The latent variable life skills were shown to be positively affected by the observed variables social skills, thinking skills, and stress coping skills. The Partnership for 21st Century Skills (2009) indicated that life skills should consist of flexibility, initiative, social skills, productivity, and leadership. Life skills should also be developed in students to help them to happily co-exist with others while helping them develop the skills necessary to overcome the challenges and barriers in a modern world. Life skills are expressed through social behavior, thought processes, emotions, and the ability to cope with stress.

The latent variable self-concept was shown to be positively affected by the observed variables self-awareness, emotional adjustment, and interpersonal relationships. The teacher should therefore focus on teaching management to encourage and develop the students’ sense of self-esteem by acknowledging the positive aspects of a students’ behavior (not negative), which promotes self-esteem in students and strengthen the bond between the teacher and the student (Emmer, Sabornie, Evertson, & Weinstein, 2011) as self-concept

is how a student judges their worth or lack thereof (Baumeister, 1998). As a child grows, self-concept is highly influenced by parents, then teachers, and then classmates. These individuals all contribute to the student’s self-concept leading to their ability to fit in (or not).

The latent variable of teacher classroom management was shown to be positively affected by the observed variables student-centered learning management, learning environment creation, and authentic learning assessment. This is consistent with the approach to education management as enacted into law by Thailand’s National Education Act B.E. 2542 (1999, as amended 2002) which stated that a supportive environment must be established by the teacher in which students have positive feelings, feel safe, and are encouraged to learn. In addition, authentic assessment is a critical component of the teacher’s classroom curriculum and should be a catalyst for student development.

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References

- Barone, C., Aguirre-Deandreis, A. I., & Trickett, E. J. (1991). Means—ends problem-solving skills, life stress, and social support as mediators of adjustment in the normative transition to high school. *American Journal of Community Psychology, 19*(2). <http://dx.doi.org/10.1007/BF00937928>
- Baumeister, R. F. (1998). The self. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (pp. 680–740). New York, NY: Random House.
- Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., & Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain. New York, NY: David McKay Company.
- Coopersmith, S. (1967). *The antecedents of self-esteem*. San Francisco, CA: Freeman.
- Cronbach, L. J. (1990). *Essentials of psychology testing* (5th ed.). New York, NY: Harper Collins Publishers Inc.

- Delors, J. (1996). *Learning: The treasure within* (Report to UNESCO of the International Commission on Education for the Twenty-first Century). Paris, France: UNESCO. Retrieved from <http://tinyurl.com/jd7xx7l>
- Dille, B., & Mezack, M. (1991). Identifying predictors of high risk among community college telecourse students. *The American Journal of Distance Education*, 2(1), 25–37. <https://doi.org/10.1080/08923649109526729>
- Distance: Preparing for a distance learning course. (2016). *University of Hawaii Community Colleges*. Retrieved from <https://tinyurl.com/zt6q6l9>
- Duckworth, A. L., & Seligman, M. E. P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, 16(12), 939–944. <http://dx.doi.org/10.1111/j.1467-9280.2005.01641.x>
- Eccles, J. S. (1999). The development of children ages 6 to 14. *The Future of Children*, 9(2), 300 – 44. <https://doi.org/10.2307/1602703>
- Education Scotland. (n.d.). *Health and wellbeing: experiences and outcomes*. Retrieved from <https://tinyurl.com/y8r2pacf>
- Emmer, E., Sabornie, E., Evertson, C. M., & Weinstein, C. S. (2011). *Handbook of classroom management: Research, practice, and contemporary issues* (3rd ed.). New York, NY: Routledge.
- Erawan, P. (2015). Healthy schools promotion: An experience in Thailand. *Procedia – Social and Behavioral Sciences*, 186, 513–521. Retrieved from <http://tinyurl.com/jxxtuyk>
- Evans, C. (2013). Making sense of assessment feedback in higher education. *Review of Education Research*, 83(1). <http://dx.doi.org/10.3102/0034654312474350>
- Fryer, B. (2007). The ethical mind. *Harvard Business Review*, March. Retrieved from <http://tinyurl.com/zlxqjhu>
- Gardner, H. (2007a). *Five minds for the future*. Boston, MA: Harvard Business School Press.
- Gardner, H. (2007b). The synthesizing mind: Making sense of the deluge of information. In M. Sanchez Sorondo, E. Malinvaud, & P. Lena (Eds.), *Globalization and education: Proceedings of the Joint Working Group* (pp. 3–18). Vatican City: The Pontifical Academy of Sciences. Retrieved from <https://tinyurl.com/y9m6nqkp>
- Grubaugh, S., & Houston, R. (1990). Establishing a classroom environment that promotes interaction and improved student behavior. *The Clearing House*, 63(8), 375–378.
- Gupteswar, R. B. (2014). *Empowering tools for today's educators: Explore & experience 21st century teaching skills*. Chennai, Tamil Nadu: Notion Press.
- Hair, J. F., Black, W. C., Black, B. J., Babin, B. J., & Anderson, R. E. (2006). *Multivariate data analysis: A global perspective* (7th ed.). New Jersey: Pearson Education.
- Hannah, R. (2013). *The effect of classroom environment on student learning* (Unpublished undergraduate thesis). Retrieved from <http://tinyurl.com/z4qovfd>
- Hashemyolia, S., Asmuni, A., Daud, S. M., Ayub, A. F. M., & Shah, J. A. (2014). Factors affecting students' self-regulated learning: Using learning management systems. *Middle-East Journal of Scientific Research*, 19, 119–124. <http://dx.doi.org/10.5829/idosi.mejsr.2014.19.icmrp.18>
- Hox, J. J., & Bechger, T. M. (1998). An introduction to structural equation modeling. *Family Science Review*, 11, 354–373.
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1–55.
- Liao, C-W., & Lin, S-Y. (2011). An analysis of the interactive behaviors of self-learning management in a web-based Moodle e-learning platform. *African Journal of Business Management*, 5(22), 9191–9199. Retrieved from <http://tinyurl.com/jxcu4nb>
- Likert, R. (1967). *The human organization: Its management and values*. New York, NY: McGraw-Hill Book.
- Mann, M., Hosman, C. M. H., Schaalma, H. P., & de Vries, N. K. (2004). Self-esteem in a broad-spectrum approach for mental health promotion. *Health Education Research*, 19(4), 357–372. <http://dx.doi.org/10.1093/her/cyg041>
- Martin, R. E., Sexton, C., Franklin, T., Gerlovich, J., & McElroy, D. (2005). *Teaching science for all children: Inquiry methods for constructing understanding*. Boston, MA: Pearson Education.
- Marzano, R. J., & Marzanoe, J. S. (2003). The key to classroom management. *Educational Leadership*, 61(1), 6–13. Retrieved from <http://tinyurl.com/6qaoxd3>
- Motschnig-Pitrik, R., & Holzinger, A. (2002). Student-centered teaching meets new media: Concept and case study. *Educational Technology & Society*, 5(4). Retrieved from <http://tinyurl.com/zhqd4e7>
- Nan-Zhao, Z. (2009). Four 'pillars of learning' for the reorientation and reorganization of curriculum: Reflections and discussions. Retrieved from <http://tinyurl.com/hlpr4hk>
- National Education Act B.E. 2542 (1999). Thailand. Retrieved from <http://asean.org/storage/2016/08/Thailand184.pdf>
- Nunnally, J. (1978). *Psychometric theory*. New York, NY: McGraw-Hill.
- O'Sullivan, M. (2006). Lesson observation and quality in primary education as contextual teaching and learning processes. *International Journal of Educational Development*, 26(3), 246–260. <https://doi.org/10.1016/j.ijedudev.2005.07.016>

- Padilla, M. J. (1990). The science process skills. Research matters—To the science teacher, No. 9004. Reston, VA: National Association for Research in Science Teaching (NARST). Retrieved from <http://www.narst.org/publications/research/skill.cfm>
- Partnership for 21st Century Learning. (2009). *Framework for 21st century learning*. Retrieved from <http://tinyurl.com/nzvwyn>
- Phuapan, P., Viriyavejakul, C., & Pimdee, P. (2016). An analysis of digital literacy skills among Thai university seniors. *International Journal of Emerging Technologies in Learning (iJET)*, 11(3). <https://doi.org/10.3991/ijet.v11i03.5301>
- Rahmantya, K. (2009, April 30). *Probability sampling - multi stage random sampling*. Retrieved from <http://tinyurl.com/zjdzdc6>
- Reeve, E. M. (2016). 21st century skills needed by students in technical and vocational education and training (TVET). *Asian International Journal of Social Sciences*, 16(4), 65–82. <https://doi.org/10.29139/aijss.20160404>
- Rogers, C. R. (1983). *Freedom to learn for the 80's*. New York, NY: Charles E. Merrill Publishing Company.
- Roper, A. R. (2007, January 1). How students develop online learning drills. *Educause Review*. Retrieved from <https://tinyurl.com/pwcvhks>
- Seth, M. (n.d.). *Enabling adolescents to build life skills*. United Nations Population fund (UNFPA). Retrieved from <http://tinyurl.com/zyd77mv>
- Thai Health Promotion Foundation. (2003). *A new framework for health promoter*. Bangkok, Thailand.
- The Ministry of Education Thailand. (2008). *The basic education core curriculum*. Retrieved from <http://tinyurl.com/jesco2x>
- Trilling, B., & Fadel, C. (2009). *21st century learning skills*. San Francisco, CA: John Wiley & Sons.
- UNICEF. (2000). *Defining quality in education*. Retrieved from <http://tinyurl.com/6qtgvwq>
- Wang, M. C., Haertel, G. D., & Walberg, H. J. (1993). Toward a knowledge base for school learning. *Review of Educational Research*, 63(3), 249–294. <https://doi.org/10.2307/1170546>
- Williams, K. C., & Williams, C. C. (2011). Five key ingredients for improving student motivation. *Research in Higher Education Journal*, 11. Retrieved from <http://tinyurl.com/zzc6en8>
- Wolf, S. (2007). Information literacy and self-regulation: A convergence of disciplines. *School Library Media Research*, 10. Retrieved from <http://tinyurl.com/hj767te>
- Wongvanakit, P. (n.d.). The study of classroom physical appearance effects on Khon Kaen University English students learning outcome. Retrieved from <http://tinyurl.com/hstklgw>
- Yamane, T. K.-K. (1973). *Statistics: An introductory analysis* (3rd ed.). New York, NY: Harper and Row.
- Young, L. (2006, May). Harvard's Howard Gardner receives standing ovation at Bank Street event. *Education Update Online*. Retrieved from <http://tinyurl.com/h5z4ms5>
- Zimmerman, B. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, 41(2). Retrieved from <http://tinyurl.com/jgeh3bj>