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8 Positive Change and Scholastic Education

Abstract: In this contribution the authors will explore the relationship between the school learning environment and positive psychological experience and theory. Specific attention will be addressed to flow, classroom experiences and optimal learning environments reported by scholars of education. The research reported in this chapter examined associations between flow and characteristics of both students and learning environments in secondary school classrooms. The theoretical bases of related lines of inquiry in Australia and the USA were derived from flow theory. The research methodology was *systematic phenomenology* in which targeted empirical questions were answered by the application of empirical tools and statistical analyses. The research shows the importance of positive relationships, intrinsic motivation, emotional support, relational support, positive self-esteem and self-concept for promoting flow and student engagement in the classroom. The application of meta-cognitive strategies such as planning, strategizing, provision of feedback, high expectations and mastery experiences were also revealed as essential facilitators of flow in learning environments.

Keywords: Flow; Positive education; Learning environment; High school

8.1 Introduction

This chapter presents two empirically validated models incorporating flow theory and classroom learning environment constructs. These models and the methods of confirmation exemplify optimal learning environments characterized by flow experiences. Each operationalizes experiences and respective conducive conditions to enable research and also to inform design of positive change in schooling. The first is the *capabilities-expectations model of student engagement in school learning* developed in Australia (Cavanagh, Kennish & Sturgess, 2008). The second is the *environmental complexity model of optimal learning environments* developed in the USA (Shernoff, Tonks, Abdi, & Cavanagh, 2013).

8.2 The Capabilities-Expectations Model of Student Engagement in School Learning

According to flow theory, experiencing flow requires a high level of skills and challenge along with a balance between these experiences. The capabilities-expectations

model of student engagement was based on this aspect of flow theory. To increase relevance to the learning environment notion, skills were reconceptualised as *learning capabilities* and challenge was reconceptualised as *expectations of learning*. Student engagement in learning was defined as a “balance between the student’s capability for learning and the *expectations of learning* in a particular learning environment – both capability and expectations are context specific” (Cavanagh, Kennish & Sturgess, 2008, p. 9). Flow is experienced when strong capabilities are applied to a situation with demanding expectations. For example, a highly competent student is expected to complete difficult tasks. This model is also applicable when less capable students are engaged. In this case, engagement is possible because although the expectations of success are low, these are commensurate with the student’s ability.

The construct of *learning capabilities* was hypothesized to be comprised of two broad attributes of students – the expressive self as typified in studies of self-esteem and self-concept and the managerial self as typified in studies of self-regulation and self-efficacy. Additionally, resilience was included in the model due to the prevalence of this notion in the research on school engagement and participation (Howard & Johnson, 1999). The five sub-constructs were operationally defined as follows (for more detail, see Cavanagh, Kennish & Sturgess, 2008):

- a) Self-esteem: Positive self-image and involving the evaluations we make about how worthy we are as human beings.
- b) Self-concept: An individual’s perception of self and “it is formed through experience with the environment, interactions with significant others, and attributions of one’s own behavior” (Marsh, Smith, Barnes & Butler, 1983, p. 773).
- c) Resilience: The overcoming of the negative effects of risk exposure and coping successfully with resulting traumatic experiences, requiring an incidence of both risks and factors that either promote a positive outcome or avoid a negative outcome.
- d) Self-regulation: Self-regulated students “are aware of the qualities of their own knowledge, beliefs, motivation, knowledge and cognitive processing – elements that jointly create situated updates of the task on which the students work” (Butler & Winne, 1995, p. 245). The awareness and gaining of information from experiences occurs through a process of feedback which can be internal (e.g. student self-reflection) or external (e.g. from the teacher). In this way, “students personally initiate and direct their own efforts to acquire knowledge and skill rather than relying on teachers, parents, or other agents of instruction” (Zimmerman, 1989, p. 329).
- e) Self-efficacy: Bandura (1986) proposed self-efficacy perceptions are developed by people interpreting information from their experiences. He proposed that the most significant source of information comes from the interpreted results of past performance, which he termed mastery experiences. These can create a strong sense of efficacy to accomplish comparable tasks in the future. Significantly, self-efficacy beliefs are context specific judgments, are sensitive to contextual factors,

and require measurement with a high degree of specificity (Bandura, 1986). Through the use of self-regulatory processes (goal-setting, self-monitoring, self-evaluation, and strategy use), student's self-efficacy beliefs influence academic motivation (Zimmerman, 2000).

The construct of *expectations of learning* was approached from the perspective of curriculum theory on the assumption that what students are expected to learn should be explicated as goals, outcomes or objectives within the curriculum. Wiggins and McTighe (2001) developed a six-faceted model of understanding. Understanding is a fundamental aspect of contemporary conceptions of learning and curriculum. Wiggins and McTighe (2001, p. 45) stressed that “understanding is family of related abilities”. The six facets of (context-specific) understanding were explained by Wiggins and McTighe (2001) as follows:

- a) Explanation: Providing thorough and justifiable accounts of phenomena, facts, and data.
- b) Interpretation: Telling meaningful stories, offering apt translations, providing a revealing historical or personal dimension to ideas and events, making subjects personal or accessible through images, anecdotes, analogies, and models.
- c) Application: Effectively using and adapting what is known in diverse contexts.
- d) Perspective: Seeing and hearing points of view through critical eyes and ears and seeing the big picture.
- e) Empathy: Finding value in what others might find odd, alien, or implausible and perceiving sensitively on the basis of prior indirect experience.
- f) Self-knowledge: Perceiving the personal style, prejudices, projections, and habits of mind that both shape and impede our own understanding, and being aware of what is not understood and why understanding is so hard.

8.3 Empirical Investigations of the Capabilities-Expectations Model

Three aspects of the *capabilities-expectations* model of student engagement in classroom learning were investigated. The first was its application in the construction of linear scales to measure student *learning capabilities* and the *expectations of their learning*. The second was estimating the match between capabilities and expectations to gauge student engagement. Specifically, measuring the proportion of students with equivalent scores for the two constructs on the premise that equivalent scores would indicate engagement. The third concerned the relationship between the engagement constructs and features of the classroom learning environment.

8.3.1 Measurement of Capabilities and Expectations

Two instruments were developed to measure student capabilities and expectations. The first was an interview rating scale with a rubric based on the *capabilities-expectations* model (Cavanagh & Kennish, 2009). Two interviewers conducted interviews with a representative sample of 195 secondary school students from city and country schools in Western Australia. Students from Years 8 to 12 reported on experiences in English, Mathematics, Science or Society and Environment classes. The interviewers assigned a rating on a scale from '0' (no evidence) to '5' using the descriptors in the *capabilities-expectations* model. Two Rasch Model (Rasch, 1960), analyses were performed using RUMM2030 (RUMMLab, 2007). The resultant fit statistics generally indicated the data fit the Rasch Model well, showing that two measures had been constructed. The second instrument elicited self-report rating scale data directly from students. The sample was 553 Secondary School students from Years 8 to 10 attending two government schools in metropolitan Perth Western Australia (Kennish & Cavanagh, 2010). The *Secondary School Engagement in Classroom Learning Survey* comprised two 25-item scales, one to measure the *learning capabilities* of a student, and the other to measure the expectations of that student's learning. After scale refinement, *learning capabilities* data and *expectations of learning* data fitted the Rasch Model signifying that they meet a variety of Rasch's criteria for a valid measure.

The analyses of the interview ratings and self-report data showed that construction of scales to measure *learning capabilities* and *expectations of learning* was feasible. The availability of measures based on the multiple component models is strong evidence of construct validity for *learning capabilities* and *expectations of learning*.

8.3.2 The Balance Between *Learning Capabilities* and *Expectations of Learning*

The *capabilities-expectations* model assumes engagement requires equivalence between what a student can do and the expectations experienced. A 27-item version of the *Secondary School Engagement in Classroom Learning Survey* was administered to 1760 secondary school students throughout Western Australia (see Cavanagh, 2012a). The sample was representative of state-wide proportions of boys and girls, subject areas (English, Mathematics, Science and Society and Environment), Year Cohort (Year 8, 9 10 and 11), and school location (metropolitan or rural/remote). Data were fitted to the Rasch Rating Scale model and scores and respective standard errors were estimated for each student for *learning capabilities* and *expectations of learning* respectively. Each pair of scores and the error in each score were then subject to a paired sample t-test. The distribution of t-values showed 17.9% (312 students) outside of the 95% confidence interval. A similar procedure was applied to data previously obtained using the interview rating process. Data from 195 students showed 17.4% (34 students) had t-values outside of the 95% confidence interval. This indicates that two

instruments applied to two different samples produced similar results. Over 80% of the students had equivalent scores for capabilities and expectations which suggests a high level of engagement in the classes and students investigated.

8.3.3 The Relationship Between Engagement Constructs and the Classroom Learning Environment

As a measure of the classroom learning environment, Cavanagh (2012b) selected items from the Classroom Environment and Educational Outcomes Questionnaire (Cavanagh & Waugh (2004). The constructs investigated were educational values, self learning outcomes, classroom/peer learning attitudes and behaviors, classroom/peer support, classroom/peer discussion, classroom planning, teacher support and expectations, as well as parental involvement. The learning environment items were combined with items from the Secondary School Engagement in Classroom Learning Survey and a 85-item instrument was administered to the sample of 1760 Western Australian secondary school students. Data were analyzed using the Rasch Model and also structural equation modeling. Data from 60 items fitted the Rasch Model well. The items were mainly on learning capabilities, expectations of learning, educational values, self learning outcomes, classroom/peer learning attitudes and behaviors, classroom/peer support, classroom/peer discussion and classroom planning. Significantly, this analysis suggests the existence of a student trait that combines their experience of engagement attributes with their experience of aspects of the classroom learning environment.

Structural equation modeling of the data was better able to explain the multi-variate nature of the data (Harbaugh & Cavanagh, 2012). The structural model included seven exogenous variables (parental support, educational values, learning outcomes, teacher expectations, learning actions, class learning, and class support via collaboration) with three endogenous variables (student perceptions of capabilities, student capability actions and classroom expectations). The model fit was excellent and eleven paths between the exogenous and endogenous variables had significant regression parameters ($\alpha = .05$ or $.001$). Specifically:

- a) Perceptions of capabilities were predicted by parental support educational values, learning outcomes, teacher expectations.
- b) Capability actions were predicted by learning actions class learning.
- c) Classroom expectations were predicted by educational values, learning outcomes, teacher expectations, and class learning.

For the endogenous variables, perceptions of capabilities predicted capability actions which in turn predicted classroom expectations. Importantly, both the Rasch Model analysis and the structural equation modeling provided evidence of strong associa-

tions between constructs in the *capabilities-expectations* model of engagement and elements of the classroom learning environment.

8.4 The Environmental Complexity Model of Optimal Learning Environments

Shernoff and colleagues similarly investigated the relationship between student engagement and the learning environment (Shernoff, Cavanagh, Tonks, Abdi, & Anderson, under review; Shernoff et al., 2013; Shernoff, Tonks, & Anderson, 2014). Shernoff, Csikszentmihalyi, Schneider and Shernoff (2003) defined engagement as an emergent state of high concentration, interest and enjoyment in learning activities, based on the subjective *experience of flow*. Consistent with the findings of Cavanagh and colleagues reported above and also supporting flow theory, they found that classroom engagement in high schools was maximized when perceived challenges and skills were high and in balance. The constructs informing the Shernoff et al. (Shernoff et al., 2014, under review) study of engagement in formal and informal learning environments evolved from decades of previous ESM research on flow and the quality of adolescents' experience (e.g., Csikszentmihalyi & Larson, 1984; Csikszentmihalyi, Rathunde, & Whalen, 1993; Csikszentmihalyi & Schneider, 2000; Hektner, Schmidt, & Csikszentmihalyi, 2007). These studies consistently identified discrete, salient aspects of adolescent experience: a) *self-esteem*, consisting of perceptions of success, meeting expectations, cooperation, control, and belongingness (referred to in Shernoff et al.'s studies as "*classroom self-esteem*" due to the classroom context), b) *intrinsic motivation*, including perceptions of interest, enjoyment, wishing to do the activity, stimulation, importance, and curiosity, c) *vitality*, including feeling competitive, creative, active, excited, and happy, and d) particularly in studies of classrooms or schools (e.g., Shernoff, 2012; Shernoff, Abdi, Anderson, & Csikszentmihalyi, in press) *academic intensity*, including perceptions of competence, challenge, effort, and concentration. Despite these consistently-found facets of experience, it is important to remember that the ESM was designed to measure an individual's overall quality of experience conceived as a unidimensional characteristic, presumably related to flow (Csikszentmihalyi, 1975; Csikszentmihalyi & Larson, 1987; Csikszentmihalyi, Larson, & Prescott, 1977). Thus, Shernoff et al. (2014, under review) sought to test for evidence of that unidimensionality, and if found, to measure it.

The work of Shernoff and colleagues is premised on the assumption that peak engagement is of intrinsic value (i.e., is its own reward) much as flow experiences are conceptualized. In addition, Shernoff (2013) also suggests that learning itself, or at least the *experience* of meaningful learning (i.e., involving the gaining of skill or acquisition of talent beyond the learning of isolated facts and rudiments of knowledge), is flow-like, consisting of experiential *episodes* characterized by motion, rhythm, and self-encapsulated meaning systems. Common examples are the experience of songs,

performances, games, and other episodes typically having a temporal beginning, middle and end. Given this assumption, Shernoff (2012, 2013) then defines optimal learning environments as those in which engagement is heightened or pervasive. These contrast to mainstream public classrooms in which engagement was found to be rare (Shernoff & Csikszentmihalyi, 2009). Based on empirical studies, several examples of optimal learning environments emerged, such as academic and arts enrichment in high quality after school programs (Shernoff & Vandell, 2007; Vandell et al., 2005), and video game approaches to traditional engineering education (Coller, Shernoff, & Strati, 2011).

Shernoff and colleagues proceeded to conduct a thorough review of the literature on student engagement, flow, motivation to learn, learning environments, and classroom climate (e.g., American Psychological Association, 1997; Brophy & Good, 1986; Fraser, 1998; Larson, 2011; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Skinner & Belmont, 1993; Turner, 2010; Urdan & Turner, 2005; Zedan, 2010) and suggested a research-based hypothesis regarding key features of learning environments promoting meaningful engagement. They hypothesized that a distinguishing, comprehensive characteristic is proposed to be *environmental complexity*, or combination of environmental challenge and environmental support. They further propose that both the environmental challenge and support dimensions are comprised of several associated but distinct components that the literature suggests are operative in facilitating engagement in learning, many of them rooted in principles of flow and positive psychology.

8.5 Dimensions of Environmental Challenge and Environmental Support

The *environmental challenge* dimension is a multifaceted construct hypothesized to feature *clear prescriptions for meaningful and goal-directed action* through:

- a) Conceptual and/or language development: Opportunities to learn or discover rules, abstract principles, or theory, and to apply them to specific contexts; activities requiring academic literacy; and opportunities to plan, strategize, utilize knowledge, and practice (e.g., Moje, 2008; National Research Council, 2001).
- b) Complex, challenging, and situated tasks: Solving meaningful problems and/or fashioning reasonably complex products with domain-specific materials or tools, requiring the development of related skills (Csikszentmihalyi, 1996; Gardner, 1993). The level of challenge is optimal for ability level (i.e., challenging but reachable; Csikszentmihalyi, 1990).
- c) Clear goals: learning goals that are clear (Csikszentmihalyi, 1990) and designed or embedded into the activity (Wiggins & McTighe, 2005).
- d) Importance/relevance of the activity: Importance or relevance of the activity to one's self (Tomlinson, 1999) or larger community (Damon, 2008; Schutz, 2006),

often in the context of real world issues or community service as with experiential or problem-based learning.

- e) **Assessment and expectations for mastery:** The clear expectation that obtained competencies will be demonstrated, performed, or assessed in a way regarded as mutually meaningful to both student and instructor, and for a level of performance that is within reasonably high standards for mastery or competency (APA, 1997; Wiggins, 1993).

The *environmental support* dimension is a multifaceted construct representing the provision of *instrumental and emotional resources necessary for meeting challenges*, including:

- a) **Motivational support:** Teacher support for autonomy (Reeve et al., 2004), competence (Urduan & Turner, 2005), interest development (Hidi & Renninger, 2006), intrinsic motivation (Deci & Ryan, 1985; Sansone & Harackiewicz, 2000), flow (Csikszentmihalyi, 1990), and/or self-efficacy (Bandura, 1977a, 1977b).
- b) **Positive Relationships:** Positive teacher-student relations and rapport; positive peer relations; social cohesion; value for individuality and diversity; and absence of negative interactions (Furrer & Skinner, 2003; Roorda, Koomen, Spilt, & Oort, 2011).
- c) **Interactivity and transactional learning:** Interactivity among teacher and students; every student has a clear and valued role; opportunities to make valued intellectual contributions; expertise is distributed; community construction of knowledge (Lave & Wenger, 1991; Zhang, Scardamalia, Reeve, & Messina, 2009).
- d) **Performance feedback:** Feedback on targeted competencies and/or performance is provided by the instructor, peers, and/or it is embedded into the activity, and is timely, specific, and accurate (Csikszentmihalyi, 1990); use of effective scaffolding (Meyer & Smithenry, 2014) presence of positive as well as constructive feedback (Kluger & DeNisi, 1996).
- e) **Physical activity:** Presence of physical activity and opportunities for action, as with “hands on” learning activities (Prince, 2004).

Overall, the challenge dimension features clear prescriptions for meaningful and goal-directed action by presenting a task to be completed or a challenge to be mastered. In the classroom, environmental challenge may be stimulated by the assessment of skills, learning, and/or performance. Similar to the research by Cavanaugh et al. (2008) described above, the challenge dimension is indicative of high expectations for academic mastery, competency, and/or success. The support dimension represents the provision of resources necessary for meeting challenges, including competence, emotional, and relational support. These features include motivational supports for students’ autonomy, interest, intrinsic motivation, and flow. Key to the

support dimension is an opportunity for activity and interactivity in which respected members are valued for their unique have unique roles and contributions.

8.6 The Influence of Learning Environment Dimensions on Student Engagement

In their 2014 study, Shernoff et al. investigated the following research question: *What is the influence of these research-based dimensions of the learning environment on students' engagement while participating in that environment?* Student engagement in high school classes was captured by the Experience Sampling Method (ESM) and linked to instructional episodes and corresponding characteristics of the learning environment assessed from videoed classroom observations. They observed seven 9th-12th grade class sessions in a variety of core subjects: English, Math, Science, Social Studies, and Spanish. A total of five teachers and 140 students in two schools (referred to as School A and School B) participated in the study. The procedure of the study was as follows. Student participants first completed a High School Background Survey that solicited age/grade level, gender, race/ethnicity, socioeconomic status, self-reported grades, and educational aspirations. Each class session was videoed in its entirety by two video cameras, one focused on the teacher and the other on a focus group of four to five conveniently located students. The Experience Sampling Method (ESM) was administered in each class observed (See Hektner, Schmidt, & Csikszentmihalyi, 2007 for reliability and validity information). Following each signal, students completed a Record of Experience (RoE), which took approximately four to five minutes to complete. It included items for which participants rated their engagement, perceptions of the activity, and their subjective mood state on Likert-type response scales. Two researchers coded the classroom videos, focusing on observations of classroom interactions preceding each ESM signal. The unit of analysis for coding was the learning environment as a whole (as opposed to the teacher or the students), coded for theoretically-based dimension of the learning environment as described above. For this purpose, an observational assessment instrument for the learning environment was created called the *Optimal Learning Environment – Observational Log and Assessment* (OLE-OLA) designed by Shernoff (2013).

Characteristics of the learning environment were then coded for each of the instructional episodes preceding each of the beeps ($n = 27$ episodes). An Optimal Learning Environment Scale (OLES) was created from the fourteen dimensions of the learning environment. For this purpose, data were analyzed with the Rasch Model (Rasch, 1960), computer program, RUMM2030 (RUMMLab, 2007). Internal reliability was high ($\alpha = .88$), and there was ample evidence of numerous aspects of validity. The scale was significantly related to students' perceptions of involvement, contributing ideas, positive affect, engagement, challenge, skill use, feeling accepted, and effort. Thus, in optimal learning environments, students were significantly but appropriately

challenged with complex tasks and high teacher expectations; and were also given the supports to be successful, including competence, motivational, relational, and social/emotional supports.

Multilevel, cross-classified models (Bryk & Raudenbush, 2002; Snijders & Bosker, 2012) were used to analyze the influence of learning environment dimensions on student engagement and other aspects of students' quality of experience. The variance component of the cross-classified instructional episode factor was significantly greater than zero, and this significant variation was entirely accounted for by the combination of all 14 dimensions of the learning environment. The Rasch measure of optimal learning environments derived from the OLES was a significant predictor of engagement after controls. A composite of only the five environmental challenge dimensions as well as a composite of the five environmental support dimensions were also significant predictors after controls.

In addition, the influence of each dimension of the learning environment was analyzed separately. Results revealed that the superordinate global rating of environmental complexity (combination of environmental challenge and support) was a positive predictor of engagement, as were both the global ratings of environmental challenge and support. Specific dimensions of the learning environment that were positively related to engagement included support for motivation, importance of the activity, clear goals, and feedback. Positive relationships were also a significant predictor, but only when the control variable for class/teacher was removed (while still controlling for person-level factors). Thus, positive relationships were significant predictor of engagement across episodes, but one likely accounted for by the specific teacher or class (i.e. "mentoring" – see chap.11).

The results suggested that there is significant variation in engagement across instructional episodes in high school classes, and that properties of the learning environment account for this variation. In addition students' engagement, as well as other markers of quality of experience, were largely accounted for by *environmental complexity*, in which environmental challenge and support were simultaneously present. Observations from videos suggested that environmental complexity was frequently created through structured tasks in individual or small group work with teacher monitoring. When students believed that what they were doing was both important and had clear goals, they were more likely to interact within the classroom environment with interest and absorb what is available in the environment. When they additionally were supported to reach those goals, both emotionally and with timely performance feedback, they adopted an attitude of excitement, fun, and interest in learning.

8.7 Conclusion

The two lines of inquiry described above sought to measure flow-oriented engagement and then to examine its association with student and learning environment

variables. The empirical studies conducted suggested that characteristics of both students and learning environments can account for variance in engagement and flow in both Australian and US classrooms.

There are some common themes that exemplify the application of positive psychological theory across the two models of student engagement and the learning environment. One is the epistemology within the models. Both models were derived from flow theory and assumed that classroom engagement was related or similar to flow experiences encountered by learners during learning activities. The *capabilities-expectations* model conceptualizes this as individual student capability for learning in conjunction with perceived expectations of what is required of the learner. In the notion of *environmental complexity*, there is a combination of environmental challenge and environmental support hypothesized to facilitate engagement in learning activities. The components within the major constructs comprising the two models are also similar and reflective of the well-being and flow aspects of positive psychology. The consonance becomes stronger when the respective learning environment elements are included. The importance of positive relationships, intrinsic motivation, emotional support, relational support, positive self-esteem and self-concept are present in both. Furthermore, application of meta-cognitive strategies such as planning, strategizing, provision of feedback, high expectations and mastery experiences can be seen.

Another theme is the methodology applied in the validation and understanding of the models characterized by *systematic phenomenology*. Such an approach investigates lived subjective experiences, the traditional concern of phenomenology, systematically using empirical tools and statistical analyses to answer targeted empirical questions. Systematic phenomenology is commonly applied in investigations of flow (Hekter, Schmidt & Csikszentmihalyi, 2007), although less commonly utilized in studies of classrooms, learning, and academic engagement. Testing the two models for evidence of construct validity using applied measurement techniques with instruments being developed, administered and data analyzed with statistical modeling (Rasch, Structural Education Modelling and Hierarchical Linear Modelling). This approach is proffered as a strength of positive psychology. Seligman (2011, p. 1) argued his "... writings [on positive psychology] are believable because of the underlying science", and the appeal coming from "... the fact that it is grounded in careful science: statistical tests, validated questionnaires, thoroughly researched exercises, and large representative samples".

Most significantly from a conceptual and theoretical standpoint is that both investigations provided evidence of significant unidimensionality among various properties of engaging classroom experiences. Although both conceptual models broke these experiences and characteristics of the students and learning environments into component parts (and in conceptually distinct ways), evidence suggests that these components are not only highly interrelated; they indeed may be part and parcel of a singular overriding classroom dynamic or quality of experience. It is not

only interesting and important, but exciting, to consider what that unidimensionality represents. What is that singular quality of learning environments when experienced as engaging? We only know that if it could be bottled and sold, teachers and students alike would line up to pay for it.

The research presented does provide a few clues, however. It is likely that learning environments are more engaging, and can be positively changed, when student capabilities and actions flourish as facilitated by the challenges, expectations and support in the learning environment. Of course, at this point we come full circle in the paradox between dimensionality and unidimensionality. So: is it one thing, or many? We cannot resolve this paradoxical riddle, but we are reasonably confident that positive change and well-being in education will be characterized by flow experiences.

References

- The American Psychological Association (1997). Learner-centered psychological principles: A framework for school redesign and reform Retrieved 10/13/10 from http://www.cdl.org/resource-library/articles/learner_centered.php
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewoods Cliffs, NJ: Prentice-Hall.
- Bandura, A. (1977a). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191-215. doi: 10.1037//0033-295X.84.2.191
- Bandura, A. (1977b). *Social learning theory*. New York: General Learning Press.
- Brophy, J. E., & Good, T. L. (1986). Teacher behavior and student achievement. In M. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed., pp. 328-375). London: Collier Macmillan.
- Bryk, A. S., & Raudenbush, S. W. (2002). *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: Sage.
- Cavanagh, R. F. (2012a). *Engagement in classroom learning: Ascertaining the proportion of students who have a balance between what they can do and what they are expected to do*. Paper presented at the 2012 Annual International Conference of the Australian Association for Research in Education, December 2-December 6, Sydney.
- Cavanagh, R. F. (2012b). *Associations between the classroom learning environment and student engagement in learning 1: A Rasch Model Approach*. Paper presented at the 2012 Annual International Conference of the Australian Association for Research in Education, December 2-December 6, Sydney.
- Cavanagh, R. F., & Kennish, P. (2009). *Quantifying student engagement in classroom learning: Student learning capabilities and the expectations of their learning*. Paper presented at the 2009 Annual International Conference Annual International Conference of the Australian Association for Research in Education November 29-December 3, Canberra.
- Cavanagh, R. F., Kennish, P., & Sturgess, K. (2008) *Development of a theoretical framework to inform measurement of secondary school student engagement with learning*. Paper presented at the 2008 Annual Conference of the Australian Association for Research in Education: Brisbane.
- Cavanagh, R. F., & Waugh, R. F. (2004). Secondary school renewal: The effect of classroom learning culture on improving educational outcomes. *Learning Environments Research*, 7(1), 245-269.
- Coller, B. D., Shernoff, D. J., & Strati, A. D. (2011). Measuring engagement as students learn dynamic systems & control with a video game. *Advances in Engineering Education*, 2, 1-32.

- Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety* (1st ed.). San Francisco: Jossey-Bass Publishers.
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper Perennial.
- Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention*. New York: HarperCollins.
- Csikszentmihalyi, M., & Larson, R. (1984). *Being adolescent: Conflict and growth in the teenage years*. New York: Basic Books.
- Csikszentmihalyi, M., & Larson, R. (1987). Validity and reliability of the experience-sampling method. *Journal of Nervous & Mental Disease*, *175*, 525-536.
- Csikszentmihalyi, M., Larson, R., & Prescott, S. (1977). The ecology of adolescent activity and experience. *Journal of Youth and Adolescence*, *6*, 281-294.
- Csikszentmihalyi, M., Rathunde, K., & Whalen, S. (1993). *Talented teenagers: The roots of success and failure*. New York: Cambridge University Press.
- Csikszentmihalyi, M., & Schneider, B. (2000). *Becoming adult: How teenagers prepare for the world of work*. New York: Basic Books.
- Damon, W. (2008). *The path to purpose: How young people find their calling in life*. New York: Free Press.
- Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York: Plenum.
- Fox, J., Nie, Z., & Byrnes, J. (2012). *Sem: Structural Equation Models*. R package version 3.0.0. Retrieved from <http://CRAN.R-project.org/package=sem>
- Fraser, B. J. (1998). Classroom environment instruments: Development, validity and applications. *Learning Environments Research*, *1*, 7-33.
- Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology*, *95*, 148-162. doi: 10.1037/0022-0663.95.1.148
- Gardner, H. (1993). *Creating minds: An anatomy of creativity seen through the lives of Freud, Einstein, Picasso, Stravinsky, Eliot, Graham, and Gandhi*. New York, NY: Basicbooks, Inc.
- Harbaugh, G., & Cavanagh, R. F. (2012). *Associations between the classroom learning environment and student engagement in learning 2: A structural equation modeling approach*. Paper presented at the 2012 Annual International Conference of the Australian Association for Research in Education, December 2-December 6, Sydney.
- Hektner, J. M., Schmidt, J. A., & Csikszentmihalyi, M. (2007). *Experience sampling method: Measuring the quality of everyday life*. Thousand Oaks, CA: Sage.
- Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist*, *41*, 111-127. doi: 10.1207/s15326985ep4102_4
- Howard, S., & Johnson, B. (1999). Tracking student resilience. *Children Australia*, *24*(3), 14-23.
- Kennish, P., & Cavanagh, R. F. (2010). *Measuring engagement in classroom learning among Western Australian students using Rasch Analysis*. Paper presented at the 2010 Annual International Conference of the Australian Association for Research in Education, November 29-December 2, Melbourne.
- Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin*, *119*, 254-284. doi: 10.1037//0033-2909.119.2.254
- Larson, S. C. (2011). *The effects of academic literacy instruction on engagement and conceptual understanding of biology in ninth grade students*. Aurora: Aurora University.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.

- Marsh, H. W., Smith, I.D., Barnes, J., & Butler, S. (1983). Self-concept: reliability, stability, dimensionality, validity, and the measurement of change. *Journal of Educational Psychology*, 75,(5), 772-790.
- Meyer, D. K., & Smithenry, D. W. (2014). Scaffolding collective engagement. In D. J. Shernoff & J. Bempechat (Eds.), *Engaging youth in schools: Evidence-based models to guide future innovations*. New York: NSSE Yearbooks by Teachers College Record.
- Moje, E. B. (2008). Responsive literacy teaching in high school content areas. . In J. R. Conley, J. R. Freidhoff, M. B. Sherry & S. F. Tuckey (Eds.), *Meeting the challenge of adolescent literacy: Research we have, research we need* (pp. 321-406). New York: The Guilford Press.
- Nakamura, J., & Csikszentmihalyi, M. (2002). The concept of flow. In C. R. Snyder and S. J. Lopez (Eds.), *Handbook of positive Psychology*. (pp. 89-105). New York, NY: Oxford University Press.
- Nakamura, J., & Csikszentmihalyi, M. (2009). Flow theory and research. In C. R. Snyder and S. J. Lopez (Eds.), *Oxford handbook of positive Psychology*. (pp. 195-206). New York, NY: Oxford University Press.
- National Research Council (2001). *Adding it up: Helping children learn mathematics*. Washington, D.C: National Academy Press.
- Prince, M. (2004). Does active learning work? A review of the research. *Journal of Engineering Education*, 93, 223-231. doi: 10.1002/j.2168-9830.2004.tb00809.x
- Rasch, G. (1960). *Probabilistic models for some intelligence and attainment tests*. Chicago: MESA Press.
- Reeve, J., Jang, H., Carrell, D., Jeon, S., & Barch, J. (2004). Enhancing students' engagement by increasing teachers' autonomy support. *Motivation and Emotion*, 28, 147-169. doi: 10.1023/B:MOEM.0000032312.95499.6f
- Roorda, D. L., Koomen, H. M. Y., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher-student relationships on students' school engagement and achievement: A meta-analytic approach. *Review of Educational Research*, 81, 493-529. doi: 10.3102/0034654311421793
- RUMMLab. (2007). *RUMM2020 Rasch Unidimensional Measurement Models*. RUMM Laboratory Pty Ltd.
- Sansone, C., & Harackiewicz, J. M. (2000). *Intrinsic and extrinsic motivation : The search for optimal motivation and performance*. San Diego, CA: Academic.
- Schmidt, J. A., Shernoff, D. J., & Csikszentmihalyi, M. (2007). Individual and situational factors related to the experience of in adolescence: A multi-level approach. In A. D. Ong and M. H. M. van Dulmen (Eds.), *Oxford handbook of methods in positive psychology (2nd ed)*. (pp.542-558). New York, NY: Oxford University Press.
- Schutz, A. (2006). Home is a prison in the global city: The tragic failure of school-based community engagement strategies. *Review of Educational Research*, 76, 691-743. doi: 10.3102/00346543076004691
- Seligman, M. E. P. (2011). *Flourish: A visionary new understanding of happiness and well-being*. New York, NY: Free Press.
- Seligman, M., Ernst, R. Gillham, K. & Linkins, M. (2009). Positive Education: positive psychology and classroom interventions. *Oxford Review of Education*, 35(3), 293-311.
- Shernoff, D. J. (2012). Engagement and positive youth development: Creating optimal learning environments. In K. R. Harris, S. Graham & T. Urdan (Eds.), *The apa educational psychology handbook*. (Vol. 3, pp. 195-220). Washington, D.C.: American Psychological Association.
- Shernoff, D. J. (2013). *Optimal learning environments to promote student engagement*. New York: Springer.
- Shernoff, D. J., Abdi, B., Anderson, B., & Csikszentmihalyi, M. (in press). Flow in schools revisited: Cultivating engaged learners and optimal learning environments. In M. J. Furlong, R. C. Gilman & E. S. Heubner (Eds.), *Handbook of positive psychology in schools* (2nd ed., pp. 131-145). New York: Routledge, Taylor, and Francis.

- Sherhoff, D. J., Cavanaugh, R. F., Tonks, S. M., , Abdi, B., and Anderson, B. (under review). The influence of theory-based dimensions of the learning environment on student engagement in high school classrooms.
- Sherhoff, D. J., & Csikszentmihalyi, M. (2009). Flow in schools: Cultivating engaged learners and optimal learning environments. In R. C. Gilman, E. S. Heubner & M. J. Furlong (Eds.), *Handbook of positive psychology in schools* (pp. 131-145). New York: Routledge.
- Sherhoff, D. J., Csikszentmihalyi, M., Schneider, B., & Sherhoff, E. S. (2003). Student engagement in high school classrooms from the perspective of flow theory. *School Psychology Quarterly, 18*, 158-176. doi: 10.1521/scpq.18.2.158.21860
- Sherhoff, D. J., Tonks, S., Abdi, B., & Cavanaugh, R. F. (2013). *Elements of the learning environment impacting student engagement in public high school classrooms*. Paper presented at the American Educational Research Association, San Francisco, CA.
- Sherhoff, D. J., Tonks, S., & Anderson, B. G. (2014). The impact of the learning environment on student engagement in high school classrooms. In D. J. Sherhoff & J. Bempechat (Eds.), *Engaging youth in schools: Evidence-based models to guide future innovations*. New York: NSSE Yearbooks by Teachers College Record.
- Sherhoff, D. J., & Vandell, D. L. (2007). Engagement in after-school program activities: Quality of experience from the perspective of participants. *Journal of Youth and Adolescence, 36*, 891-903. doi: 10.1007/s10964-007-9183-5
- Skinner, E. A., & Belmont, M. J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85*, 571-581. doi: 10.1037/a0012840
- Snijders, T. A. B., & Bosker, R. J. (2012). *Multilevel analysis: An introduction to basic and advanced multilevel modeling* (2nd ed.). Thousand Oaks, CA: Sage.
- Tomlinson, C. A. (1999). *The differentiated classroom: Responding to the needs of all learners* (pp. 145). Alexandria VA: Association for Supervision and Curriculum Development.
- Turner, J. C. (2010). *Understanding classroom research and its contributions to our understanding of motivation to learn*. Paper presented at the annual meeting of the American Educational Research Association, Denver, CO.
- Urdu, T. C., & Turner, J. C. (2005). Competence motivation in the classroom. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 297-317). New York: Guilford.
- Vandell, D. L., Sherhoff, D. J., Pierce, K. M., Bolt, D. M., Dadisman, K., & Brown, B. B. (2005). Activities, engagement, and emotion in after-school programs (and elsewhere). *New Directions for Youth Development, 150*, 121-129. doi: 10.1002/yd.111
- Wiggins, G. (1993). Assessment: Authenticity, context, and validity. *Phi Delta Kappan, 75*, (3) 200-208, 210-214.
- Wiggins, G., & McTighe, J. (2005). *Understanding by design, expanded 2nd edition*. Alexandria, VA: Association for Supervision and Curriculum Development.
- Zedan, R. (2010). New dimensions in the classroom climate. *Learning Environments Research, 13*, 75-88. doi: 10.1007/s10984-009-9068-5
- Zhang, J., Scardamalia, M., Reeve, R., & Messina, R. (2009). Designs for collective cognitive responsibility in knowledge-building communities. *Journal of the Learning Sciences, 18*, 7-44. doi: 10.1080/10508400802581676
- Zimmerman, B. J. (1989). A social cognitive view of self-regulated academic learning. *Journal of Educational Psychology, 81*(3), 329-339.
- Zimmerman, B.J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology, 25*, 82-91.