The case of flow and learning revisited

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The case of flow and learning revisited

Young K. Ro, Yi Maggie Guo, and Barbara D. Klein

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ABSTRACT

Many business schools are criticized for being ineffective in helping students learn proper management skills and knowledge. Flow theory has been cited as being helpful in many learning environments in that flow experience can enhance student learning. The authors conducted a study of 315 students in an undergraduate operations management (OM) class to assess learning outcomes and flow experience. Results show that student learning performance and flow are related. Implications and suggestions for further research are provided.

KEYWORDS

Business school; flow theory; learning outcomes; pedagogy; student learning

There exists much criticism regarding the quality of education students receive in business schools and management programs around the world today. Many notable scholars have espoused both concerns and criticisms regarding the current state of business and management pedagogy and research (e.g., Donaldson, 2002; Ghoshal, 2005; Hambrick, 1994; Leavitt, 1989; Pfeffer & Fong, 2002) within even some of the most reputable business schools. Although business schools are a popular choice of students at both the undergraduate and graduate levels, the volume of relevant learning of valuable managerial and leadership skills is questionable (Ghoshal, 2005; Pfeffer, 2007; Pfeffer & Fong, 2002). In response to these criticisms, educators working in business schools have recently developed and implemented a variety of pedagogical innovations such as concept-oriented games (Arora & Arora, 2015; Dhumal, Sundararaghavan, & Nandkeolyar, 2008; Giraud-Carrier & Schmidt, 2015; Liao-Troth, Thomas, & Webb, 2015; Ozpolat, Chen, Hales, Yu, & Yalcin, 2014; Sarkar & Kumar, 2016), simulations (Ellis, Goldsby, Bailey, & Oh, 2014; Harnowo, Calhoun, & Monteiro, 2016; Miller & Maellaro, 2016), academic service learning projects (Behara & Davis, 2015), problem-based learning (Nargundkar, Samaddar, & Mukhopadhayay, 2014; Sroufe & Ramos, 2015), active learning exercises (Donovan & Fluegge-Woolf, 2015; Hill & Baker, 2016; Pinder, 2013; Strakos, 2016), teams composed of students attending universities in different countries (Bartel-Radic, Moos, & Long, 2015), blended learning (Chou & Chou, 2011), and flipped classrooms (Asef-Vaziri, 2015; Green, 2015; Scorvetti, 2016; Swart & Wuensch, 2016).

Both traditional methods of instruction and newer pedagogical approaches demand innovative approaches to the assessment of student learning. Regarding business school faculty, it is now known that instructor ratings—as a measure of students’ satisfaction with their faculty instructors—bear little correlation to what students actually learn in the classroom (Attiyeh & Lumdsen, 1972; Pfeffer, 2007). This sheds dubious light on the validity of course and instructor ratings. As for students, scholastic performance as measured by a grade point average and the timely finish of an accredited business school curriculum seem to generate scant evidence of actual learning (Pfeffer & Fong, 2002). This brings to question the idea that grade assessment is a proper measure of the learning and mastery of successful business and management skills. In short, the educational process taking place in the majority of modern-day business schools should be reconsidered to assess whether relevant learning is, in fact, taking place.

Is learning truly occurring in the business school classroom? If it is, how can it be assessed? What ramifications does this have on the present condition of business education? Mihalyi Csikszentmihalyi—the originator of flow theory and a professor of education and human development—when sharing his approach to learning, stressed that some of the major barriers to learning could be motivational and emotional in nature and not necessarily intellectual or cognitive (Csikszentmihalyi, 1997). He developed flow theory to help explain and provide ways to improve the process of learning, and it is this theory of flow that may provide some valuable insights into the potent questions regarding business education posed earlier.

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Csikszentmihalyi’s theory of flow (Beard, 2015) entails the study and evaluation of learning activities and tasks in order to improve the effectiveness of learning and teaching methods at differing levels of education in a number of disciplines. In its essence, flow theory emphasizes the notion of intrinsic, and not extrinsic, motivation. An individual enters into a state of flow when he or she performs a task (either doing or learning) that is reasonably challenging, engaging, and interesting. This state then motivates the individual to undergo a particular task with energy and attentiveness, ultimately increasing the capability to do and learn. As a person may actually learn more and better when motivated, we posit that if the learning process can facilitate the flow experience for students, then they should be able to undergo a greater amount of learning. As a result, flow theory may yield valuable insights in improving the process of education occurring in business schools today. It is the pursuit of the question of whether flow theory can be applied to further understand the student learning experience and learning outcomes in business schools that prompted this study.

The design of this study is based on a theory-driven, empirical, a priori hypothesis testing approach. The structure of the article is as follows. In the next section, we provide a literature review and examine the theory of flow theory can be applied to further understand the student learning experience and learning outcomes in business schools that prompted this study. The empirical results of our study are then presented in the Data Analysis and Results section. Then in the subsequent section, we discuss the results and provide some pedagogical implications. Last, we conclude the article with some limitations of our study and suggestions for future researchers.

**Literature review**

**Flow: The silver bullet?**

For over three decades, the flow experience has been researched in many different learning environments (Ghani, 1995; Parr, Montgomery, & DeBell, 1998; Rathunde, 2003; Whalen, 1998). The concept of the flow experience was first developed by Csikszentmihalyi (1975) when trying to study aspects of enjoyment, and he described it as being “the crucial component of enjoyment” (p. 11). Individuals experiencing flow are so caught up in a task that they are often not conscious of their movements or the passage of time. As mentioned previously, this experience involves intrinsic motivation and has been described as a holistic sensation that individuals feel when they undertake an activity or undergo an experience with deep involvement and total concentration (Csikszentmihalyi, 1975, 1990; Csikszentmihalyi & LeFevre, 1989). The flow experience occurs when an individual partakes in an activity for its own sake. The state is so satisfying that individuals are motivated to repeat an activity continually and at progressively higher levels of challenge (Csikszentmihalyi, 1988). While experiencing flow, individuals may experience loss of awareness of self and forget their everyday concerns (Csikszentmihalyi, 1975). Individuals in flow may involve themselves in a task with such intense concentration and vigor that it could lead to improvements in performance and learning capabilities (Guo & Ro, 2008).

A link between the flow experience and learning has been posited by many scholars. The flow experience has been shown to promote learning and development among teenagers and young adults (Rathunde, 2003) as well as high school students (Parr, Montgomery, & DeBell, 1998; Shernoff, Csikszentmihalyi, Shneider, & Shernoff, 2003; Whalen, 1998). Several research studies on flow have investigated learning in higher education (Everett & Raven, 2015; Ghani, 1995; Smith, 2005), foreign language studies (Egbert, 2004), music pedagogy (Custodero, 2002; Wrigley & Emmerson, 2011), instruction using hypermedia (Chan & Ahern, 1999; Konradt, Filip, & Hoffmann, 2003; Rha, Williams, & Heo, 2005), and distance learning (Liao, 2006). In recent years, researchers have examined the flow experience in more interactive learning settings involving game playing (Admiraal, Huizenga, & Akkerman, & ten Dam, 2011; Raphael, Bachen, & Hernández-Ramos, 2012), video games (Hou, 2015; Kiili, 2005), and virtual environments (Faiola, Newlon, Pfaff, & Smylova, 2013). Limited research has tied flow to business education and training. One study looked at the flow experience and learning outcomes in online enterprise resource planning (ERP) training (Choi, Kim, & Kim, 2007). Another study examined students’ flow experiences when playing an online education game that was designed for production issues (Kiili, 2005). However, many of these previous investigations concerning flow and learning utilized more subjective measures of learning outcomes such as the usage of verbatim interviews, testimonials, and the like. In studies using more quantitative approaches, flow experiences have been found to have an effect on developing positive attitudes and behaviors, such as the intention to learn and explore (Liao, 2006; Raphael, Bachen, & Hernández-Ramos, 2012), on improving the excitement for learning during educational game performance (Admiraal, Huizenga, Akkerman, & ten Dam, 2011), and on a more in-depth reflective thinking process (Hou, 2015). Despite this existing body of work, only a few (e.g. Guo, Klein,
Preconditions & dimensions of flow

There exist three structural characteristics, or preconditions, to inducing flow. Flow theory suggests that flow activities share these three preconditions: (a) the activities have a clear goal, (b) the activities incorporate a timely and unambiguous feedback mechanism, and (c) the actor perceives a balance of challenge and skill (Csikszentmihalyi, 1975). All three characteristics are deemed to be valuable in learning settings, and the existence of these factors explains why people may experience flow when playing games or sports. For flow to occur, the tasks should have a clear goal and provide quick, nonconfusing feedback. The task or activity also needs to be challenging, but not to the point where the individual does not possess enough skill to accomplish it.

As flow is a dynamic evolving force, it is difficult for someone to be in a state of flow for extremely long durations since the level of challenge and skill perceived by the individual fluctuates over time. The longer an individual engages in a particular task or activity, the more bored he or she may become with it—unless, of course, the task or activity becomes more challenging over time.

In addition to these preconditions, Csikszentmihalyi (1975), Csikszentmihalyi, 1988, 1990 proposed several dimensions of flow—factors that could be used to assess whether a person is in flow while performing a task. These dimensions include (a) focused concentration, (b) merging of activity and awareness, (c) perceived control, (d) transformation of time (or time distortion), (e) loss of self-consciousness (or transcendence of self), and (f) enjoyment (also described as an autotelic experience; Csikszentmihalyi, 1988). In past research, it has been reported that focused concentration and a sense of perceived control were among the most dominant indicators of flow in foreign language acquisition (Egbert, 2004).

Focused concentration, perceived control, time distortion, and enjoyment were terms used by subjects when describing the state they had experienced when engaging in an educational game (Kiili, 2005) and when learning and interacting with computer software (Ghani, 1995).

As flow is a general theory of experience, the flow state experienced by individuals may vary based on different situational contexts; in some contexts, the strength of various flow characteristics will differ. Our current study’s research setting, as will be explained in further detail in the Methodology section, takes place in a traditional lecture-based instructional classroom environment where students receive instruction on a particular topical lesson from an in-class instructor. Given that our study focuses on an intellectual task with little physical activity requirement, the two flow dimensions of merging of activity and awareness and loss of self-consciousness were not considered relevant since they apply more to physical tasks such as dancing or playing basketball. It is a common practice that various dimensions of flow have been adapted into particular research contexts (Esteban-Millat, Martinez-López, Luna, & Rodríguez-Ardura, 2014). For example, control, focus, and enjoyment were the dimensions of flow experience studied in online shopping activities (Jiang & Benbasat, 2005), while in an online learning context, researchers have looked at control, concentration, curiosity, and interest (Ho & Kuo, 2010). Also, Siekepe (2005) conducted a comparison of reflective and formative models of flow and suggested that dimensions of flow should be formulated as reflective first-order latent variables or indicators of the flow construct, which is a second-order factor. In this particular study, the aspects of flow experience in classroom learning are the focus; thus, our study proposes a research model on the four remaining dimensions of flow (focused concentration, perceived control, transformation of time, and enjoyment). Quoted definitions concerning the three preconditions and four dimensions of flow that are appropriate for our particular study are displayed in Table 1.
Hypothesis development

The primary research question investigated in this paper is whether there exists a relationship between the flow experience and student learning outcomes. The evidence of such a relationship would suggest that pedagogical interventions designed to facilitate the flow experience among students could improve learning outcomes. Prior research suggests that flow experience has been associated with improved learning outcomes (Csikszentmihalyi, Rathunde, & Whalen, 1997), at least when measured by subjective measures such as technology self-efficacy (Choi, Kim, & Kim, 2007). One commonly accepted measure of assessing student learning in the business school environment is to objectively measure student performance on quizzes and tests. However, performing well on quizzes and tests also requires other attributes such as perseverance and improvisation in addition to knowledge acquisition.

When considering the cognitive viewpoint on learning outcomes, Shuell (1986) posits that learning takes place via changes in knowledge representations and mental models. This implies that student learning performance, in addition to objective measures on quizzes and tests, can also be assessed indirectly by measuring student perceptions of learning outcomes (Alavi, Marakas, & Yoo, 2002). To accommodate this broader perspective on learning, we also examined perceived learning in addition to learning performance. Perceived learning can be understood as students’ perceptions of their own learning of the relevant subject matter as well as students’ perceptions of their skill development. Last, student satisfaction is considered an important performance outcome in higher education (Abdous & Yen, 2010; Colburn, Sullivan, & Fox, 2012; Duque & Weeks, 2010; Eom & Ashill, 2016; Eom, Wen, & Ashill, 2006; Orus et al., 2016; Wiechowski & Washburn, 2014). If students experience flow during class sessions, we would anticipate improvements in measures of student satisfaction. In sum, we were interested in four different learning outcomes—learning performance (i.e., improvement in objective quiz scores), perceived learning of the subject matter, perceived skill development, and student satisfaction. Figure 1 depicts the proposed research model of flow experience and learning outcomes.

The primary research question can be tested by a series of hypotheses involving the four learning outcomes described previously. As such, we proposed the following hypotheses.

Hypothesis 1: There exists a positive relationship between the flow experience and objective learning of subject matter.

Hypothesis 2: There exists a positive relationship between the flow experience and perceived learning of the subject matter.

Hypothesis 3: There exists a positive relationship between the flow experience and perceived skill development.

Hypothesis 4: There exists a positive relationship between the flow experience and student satisfaction.

In our study, the occurrence of flow was measured in three different ways. First, an overall flow score was reported by the student respondents. Second, scores were obtained for the four dimensions of flow experience, clear goal, feedback, balance of challenge and skill, focused concentration, and perceived control. Last, the transformation of time and enjoyment dimensions were assessed. Figure 1 illustrates the research model of flow and learning.

Table 1. Flow preconditions and dimensions.

<table>
<thead>
<tr>
<th>Construct</th>
<th>Construct type</th>
<th>Quotable definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear goal</td>
<td>Precondition</td>
<td>“The activity must have relatively clear goals.” (Csikszentmihalyi, 1988, p. 32)</td>
</tr>
<tr>
<td>Feedback</td>
<td>Precondition</td>
<td>“Provide rather quick and unambiguous feedback.” (Csikszentmihalyi, 1988, p. 32)</td>
</tr>
<tr>
<td>Balance of challenge and skill</td>
<td>Precondition</td>
<td>“A challenging activity that requires skills.” (Csikszentmihalyi, 1990, p. 49)</td>
</tr>
<tr>
<td>Perceived control</td>
<td>Dimension</td>
<td>“Lacking the sense of worry about losing control.” (Csikszentmihalyi, 1990, p. 59)</td>
</tr>
<tr>
<td>Transformation of time</td>
<td>Dimension</td>
<td>“Distorted sense of time.” (Csikszentmihalyi, 1988, p. 33)</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>Dimension</td>
<td>“The key element of an optimal experience is that it is an end in itself.” (Csikszentmihalyi, 1990, p. 67)</td>
</tr>
</tbody>
</table>
(i.e., focused concentration, perceived control, transformation of time, and enjoyment). Third, scores were obtained for the three preconditions of flow (i.e., clear goal, feedback, and balance of challenge and skill). To measure objective learning of subject matter, we first measured the performance of student respondents on prelecture and postlecture multiple-choice quizzes and then calculated the change in scores between the prelecture and postlecture quizzes. We also measured student perceptions of their perceived learning of the subject matter as well as their perceived skill development. And finally, we measured student satisfaction.

The four proposed hypotheses were then tested in a varied set of regression models. Both the objective measures and self-reported measures of learning outcomes are used as dependent variables in the study, and the four dimensions of flow and three preconditions of flow served as the independent variables. In testing the first hypothesis, the improvement in performance scores on multiple-choice quizzes (i.e., the change in score between the prelecture and postlecture quiz) were used as an objective measure of learning performance. In testing the second, third, and fourth hypotheses, the self-reported measures of perceived learning, perceived skill development, and satisfaction were used.

**Methodology**

To test the proposed hypotheses, an empirical field study project was conducted during real business classroom lectures, and data were collected in an introductory undergraduate operations management (OM) course. The course sessions used a traditional lecture-oriented approach to delivering instruction. The subjects of the study included undergraduate business majors in a public, urban, American university. Two versions of questionnaires were distributed, one at the beginning of class (prelearning) and one immediately following the lecture (postlearning). The prelearning questionnaire asked for basic demographic data, including age, gender, class standing, and major. In addition, a quiz consisting of five multiple-choice questions related to the learning material was also part of the questionnaire. Student performance on this prelearning questionnaire quiz would provide a baseline for student learning. The postlearning questionnaire filled out by students at the end of the lecture also contained the same quiz. The change in scores between the prelearning quiz and postlearning quiz would provide an objective measure of student learning occurring during the class. Each class lasted 75 min in length and consisted of a conventional lecture delivered by an experienced instructor on a subset of OM topics accompanied with PowerPoint slides. No explicit attempt was made to induce flow through the delivery of the lecture content because the focus of the study was to examine the effect of flow as it naturally occurs during traditional lecture-based instruction. Because of this, no class activities, role play, case study discussion, or simulation exercises were conducted during the class. At the beginning of the 75-min lecture, students were informed about the study and told that they would be filling out a questionnaire at the beginning and at the end of the class; no mention of pre- and postlearning quizzes being embedded in the questionnaires was made (preventing any extrinsic motivation for learning). Students were also told that their responses on the prelearning and postlearning questionnaires would have no impact on their course grade. Participation in the study was voluntary. Data was collected during three separate semesters. In developing the measurement instrument, existing scales were used whenever possible, and were carefully adapted into the current context. Extra care and effort was paid to maintain the confidentiality and anonymity of subjects and to ensure voluntary participation of the subjects.

A traditional lecture method of content delivery was employed by the instructor during the class sessions. The instructor was rather knowledgeable in the subject matter and had a reputation of being one of the ‘better’ instructors in the department. In the postlearning questionnaire, subjects were asked about their experience during the lecture. Flow experience was measured using adapted questions from the Flow State Scale, which was developed and validated in previous studies (Guo, 2004; Jackson & Marsh, 1996). One question is included at the end of the questionnaire asking subjects to rate their overall flow experience. Perceived learning was measured using a questionnaire by (Alavi et al., 2002). Two aspects of perceived learning are perceived subject-matter learning (eight items) and perceived skill development (four items). Also, in this questionnaire the same five multiple-choice questions regarding the lecture content were presented. Thus, student learning is measured by the change of score from the prelecture quiz to the postlearning quiz.

We also measured the satisfaction of students regarding the lecture with three questions taken from standard class evaluations. The last question of the questionnaire asked the subject to rate their experience based on a short description of flow experience (“I will say I was in flow”; Novak, Hoffman, & Yung, 2000). This question was included for cross validation of flow measures. A list of the items appears in Appendix A for reference.

The threat of social desirability bias was managed in this study by using anonymous questionnaires that were administered by a member of the research team other than the course instructor. Students were told that the
course instructor would not have custody of the questionnaires and would not view individual questionnaires.

**Data analysis and results**

A total of 315 complete questionnaires were collected for this study. A total of 157 (50%) participants were women. The majority of subjects were undergraduates with junior or senior standing, averaging over 20 years old. Over 90% of the participants were management and business majors.

**Measurement assessment**

Reliability of measurement was evaluated by Cronbach’s alpha to assess the internal consistency of the items representing each construct (see Table 2). The Cronbach’s alpha coefficients of most of the constructs were above the acceptable level of reliability of .70 (Nunnally & Bernstein, 1994), except transformation of time (.56). After dropping one item (“It felt like time flew by during the lecture”), the reliability increased to .74.

**Learning Outcomes**

Learning outcome was measured by four dependent variables: the change between postlearning quiz and prelearning quiz, perceived learning of the subject matter, perception of skill development, and student satisfaction. Descriptive statistics of the results are given in Table 3. In the questionnaire, all items for latent constructs were described in the format of a 5-point Likert-type scale with responses ranging from 1 (strongly disagree) to 5 (strongly agree). For example, one item regarding satisfaction was, “I have learned a lot in the lecture.” The mean values of subject matter learning, skill development, and satisfaction, were significantly different from 3.00 and all greater than 3.00 (on a two-tailed t test). Table 3 displays the descriptive statistics of learning outcomes generated in the study.

**Table 3. Descriptive statistics of learning outcomes.**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Minimum</th>
<th>Maximum</th>
<th>M</th>
<th>SD</th>
<th>t (two tailed)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective learning of subject matter</td>
<td>-3.00</td>
<td>4.00</td>
<td>1.08</td>
<td>1.42</td>
<td>13.53</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Perceived learning of subject matter</td>
<td>1.00</td>
<td>5.00</td>
<td>3.58</td>
<td>0.57</td>
<td>18.05</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Perceived skill development</td>
<td>1.00</td>
<td>5.00</td>
<td>3.74</td>
<td>0.59</td>
<td>22.26</td>
<td>&lt; .01</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>1.00</td>
<td>5.00</td>
<td>3.81</td>
<td>0.57</td>
<td>25.45</td>
<td>&lt; .01</td>
</tr>
</tbody>
</table>

Note: N = 315.

**Factors affecting learning**

Multiple regressions were used to better understand the relationships among dependent and independent variables in our model. SPSS 22.0 for Windows was the software used. For the latent constructs, the average scores of the items representing the construct were used in data analysis. The effect of flow on each learning outcome was tested in three different types of regression models. First, the overall flow score was used as the independent variable. Second, the four dimensions of flow were used as independent variables; and finally, the three characteristics of flow activities were used as independent variables.

**Objective learning of subject matter**

Overall, our study finds support for the notion that being in a state of flow contributes to objective learning of subject matter (as measured by improvements in prelecture and postlecture quiz scores). The regression model with objective learning of the subject matter as a dependent variable was significant (p = .027, b = .124).

The model using the four dimensions of flow as independent variables is not significant when objective learning of subject matter is the dependent variable (p = .637). The models using the three characteristics of flow activities as independent variables relate to objective learning of subject matter. But the results should be interpreted with caution since the adjusted R² value is very low for all significant models. Model details can be found in Table 4.

**Perceived learning of subject matter**

With regard to perceived learning of the subject matter, all three of these models support the proposition that flow is related to this learning outcome. The overall flow score is related to perceived learning of the subject matter (p < .001). The model using the four dimensions of flow relates to perceived learning of the subject matter (p < .001), with perceived control (b = .309), transformation of time (b = -.083), and enjoyment (b = .590) being statistically significant. The model using the three
Table 4. Empirical results.

<table>
<thead>
<tr>
<th>Learning Outcome</th>
<th>Predictor</th>
<th>Standard coefficient (β)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective learning of subject matter</td>
<td>Overall flow</td>
<td>.124*</td>
</tr>
<tr>
<td></td>
<td>p = .027, adj. R² = .012</td>
<td></td>
</tr>
<tr>
<td>Objective learning of subject matter</td>
<td>Perceived control</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Transformation of time</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Autotelic experience</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>p = .637, adj. R² = .005</td>
<td></td>
</tr>
<tr>
<td>Objective learning of subject matter</td>
<td>Perceived balance of challenge and skill</td>
<td>.207**</td>
</tr>
<tr>
<td></td>
<td>Goal clarity</td>
<td>−.171</td>
</tr>
<tr>
<td></td>
<td>Feedback</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>p = .019, adj. R² = .022</td>
<td></td>
</tr>
<tr>
<td>Perceived learning of subject matter</td>
<td>Overall flow</td>
<td>.661**</td>
</tr>
<tr>
<td></td>
<td>p &lt; .001**, adj. R² = .435</td>
<td></td>
</tr>
<tr>
<td>Perceived learning of subject matter</td>
<td>Perceived control</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Transformation of time</td>
<td>.309**</td>
</tr>
<tr>
<td></td>
<td>Autotelic experience</td>
<td>−.083**</td>
</tr>
<tr>
<td></td>
<td>p = .191**, adj. R² = .724</td>
<td></td>
</tr>
<tr>
<td>Perceived learning of subject matter</td>
<td>Perceived balance of challenge and skill</td>
<td>.222**</td>
</tr>
<tr>
<td></td>
<td>Goal clarity</td>
<td>.242**</td>
</tr>
<tr>
<td></td>
<td>Feedback</td>
<td>.449**</td>
</tr>
<tr>
<td></td>
<td>p &lt; .001**, adj. R² = .652</td>
<td></td>
</tr>
<tr>
<td>Perceived skill development</td>
<td>Overall flow</td>
<td>.535**</td>
</tr>
<tr>
<td></td>
<td>p &lt; .001**, adj. R² = .284</td>
<td></td>
</tr>
<tr>
<td>Perceived skill development</td>
<td>Perceived control</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Transformation of time</td>
<td>.555**</td>
</tr>
<tr>
<td></td>
<td>Autotelic experience</td>
<td>.331**</td>
</tr>
<tr>
<td></td>
<td>p = .191**, adj. R² = .551</td>
<td></td>
</tr>
<tr>
<td>Perceived skill development</td>
<td>Perceived balance of challenge and skill</td>
<td>.228**</td>
</tr>
<tr>
<td></td>
<td>Goal clarity</td>
<td>.195**</td>
</tr>
<tr>
<td></td>
<td>Feedback</td>
<td>.429**</td>
</tr>
<tr>
<td></td>
<td>p &lt; .001**, adj. R² = .569</td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Overall flow</td>
<td>.600**</td>
</tr>
<tr>
<td></td>
<td>p &lt; .001**, adj. R² = .357</td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Perceived control</td>
<td>ns</td>
</tr>
<tr>
<td></td>
<td>Transformation of time</td>
<td>.297**</td>
</tr>
<tr>
<td></td>
<td>Autotelic experience</td>
<td>−.134**</td>
</tr>
<tr>
<td></td>
<td>p = .191**, adj. R² = .529</td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>Perceived balance of challenge and skill</td>
<td>.198**</td>
</tr>
<tr>
<td></td>
<td>Goal clarity</td>
<td>.242**</td>
</tr>
<tr>
<td></td>
<td>Feedback</td>
<td>.408**</td>
</tr>
<tr>
<td></td>
<td>p &lt; .001**, adj. R² = .559</td>
<td></td>
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</tbody>
</table>

Note: N = 315, *p < .05, **p < .01.

With the four dimensions of flow activities relates to perceived learning of the subject matter (p < .001), with goal clarity (β = .242), feedback (β = .449) and perceived balance of challenge and skill (β = .222) as statistically significant predictors. With regard to students’ perceived skill development, all three models are significant, supporting the proposition that flow is related to skill development perception. The overall flow score is related to perceived skill development (p < .001). The model using the four dimensions of flow relates to perceived skill development (p < .001), with perceived control (β = .555) and enjoyment (β = .331) being statistically significant. The model using the three characteristics of flow activities relates to perceived skill development (p < .001), with goal clarity (β = .195), feedback (β = .429), and balance of skill and challenge (β = .228) being statistically significant.

Student satisfaction

With regard to student satisfaction, all three models support the proposition that flow is related to student satisfaction. The overall flow score is related to student satisfaction (p < .001, b = .600). The model using the four dimensions of flow relates to student satisfaction (p < .001). Sense of control (β = .297), transformation of time (β = −.134), and enjoyment (β = .457) are all statistically significant. The model using the three characteristics of flow activities is also significant (p < .001). All three characteristics, goal clarity (β = .242), feedback (β = .408), and perceived balance of challenge and skill (β = .198), are statistically significant and have positive coefficients.

Summary of results

Based on our results, it is clear that student learning occurred in terms of both objective measures based on changes in quiz scores and subjective student perceptions of subject matter learning and skill development. When looking back at the four proposed hypotheses, we find mixed support among the empirical evidence in this study. Regarding the relationship between flow experience and learning performance (Hypothesis 1), we find adequate support, at least with regard to learning performance as measured by answers to prelearning and postlearning quiz scores concerning the relevant subject matter. The reported R² values, however, are low, implying the existence of invisible factors that could explain the variance shown in the data. Although the regression models using the preconditions and dimensions of flow as independent variables proved to be significant, the model fit is so poor that the relationship is inconclusive. Regarding the relationship between flow experience and perceived learning of subject matter (Hypothesis 2), we find strong evidence supporting this. With regard to the relationship between flow experienced and perceived skill development (Hypothesis 3), we also find evidence supporting this. Last, there is strong evidence supporting the existence of a positive relationship between the flow experience and student satisfaction (Hypothesis 4). A summary of the results of the tests of the proposed hypotheses is shown in Table 5.
Discussion and implications

A case for flow still exists

As our results suggest that the flow experience can be directly related to objective measures of learning as measured by quiz scores, it may be useful as a means to enhance the student learning experience. In its essence, flow theory deals with motivational issues of learning. People experiencing flow during a particular activity tend to find that activity internally rewarding and are thus more willing to participate in the same activity later, and presumably, at a more demanding level. And over a duration of time while engaged in the flow activity, people will develop better skills in performing the task. Recontextualizing this phenomenon to a learning environment, the flow experience can be thought of as a manifestation of the joy of learning. Not only can it improve learning of a particular learning session, in the long run, but it can also promote motivation for continued learning.

With the recent research on various pedagogical innovations occurring in business schools (described earlier in the introduction), the use of concept-oriented games (e.g. Dhumal, Sundararaghavan, & Nandkeolyar, 2008; Sarkar & Kumar, 2016), simulations (e.g. Ellis, Goldsby, Bailey, & Oh, 2014; Miller & Maellaro, 2016), academic service learning projects (e.g. Behara & Davis, 2015), problem-based learning (e.g. Nargundkar, Samaddar, & Mukhopadhyay, 2014; Strakos, 2016), blended learning (e.g. Chou & Chou, 2011), and flipped classrooms (e.g. Asef-Vaziri, 2015; Swart & Wuensch, 2016) are diverse pedagogical approaches that could be implemented to induce flow in students. It thus behooves educators in business schools to proactively incorporate such innovations in the business classroom.

These approaches provide for many practical ways instructors can take advantage of flow in students to enhance the learning experience. For instance, the increased use of competitive learning games and pedagogical simulations of real-world business experience could enhance student learning. Connecting student grade performance to their performance in these learning games and simulations could also induce flow more readily in students as the competitive aspect of learning would drive some students more intrinsically. As a concrete example, in a product development class, students could actually create a physical product or prototype that they could showcase at a trade show at the term’s end. Fellow students, faculty, staff, and members of the public can observe these student-created products and vote (with mock money) on which of the products they would prefer to buy. The student(s) whose product generates the greatest profit, or gains the most votes, would earn the highest grades for the course (with lower grades being assigned to the less popular products). The same could be said about the use of case studies or even real-world business problems for local companies. Student groups can analyze a case study or real-world problem using relevant concepts and tools learned in a particular class, and formulate recommendations or solutions. A panel of judges comprised of individuals from the business world (e.g. members of the Board of Advisors of the College of Business) or from the client company would then evaluate the quality of the analyses and recommendations generated by the student groups, and assign grades accordingly. This would also more closely

Table 5. Summary of hypothesis tests.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Dependent variable (learning outcome)</th>
<th>Independent variables (measure of flow)</th>
<th>Model significant?</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis 1: There is a relationship between flow and objective learning of subject matter.</td>
<td>Objective learning of subject matter</td>
<td>Overall flow score</td>
<td>Yes</td>
<td>Partially supported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions of flow</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Characteristics of flow activities</td>
<td></td>
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<tr>
<td>Hypothesis 2: There is a relationship between flow and perceived learning of subject matter.</td>
<td>Perceived learning of subject matter</td>
<td>Overall flow score</td>
<td>Yes</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions of flow</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Characteristics of flow activities</td>
<td></td>
<td></td>
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<tr>
<td>Hypothesis 3: There is a relationship between flow and students’ perceived skill development.</td>
<td>Perceived skill development</td>
<td>Overall flow score</td>
<td>Yes</td>
<td>supported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions of flow</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Characteristics of flow activities</td>
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<tr>
<td>Hypothesis 4: There is a relationship between flow and student satisfaction.</td>
<td>Student satisfaction</td>
<td>Overall flow score</td>
<td>Yes</td>
<td>supported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dimensions of flow</td>
<td></td>
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<tr>
<td></td>
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<td>Characteristics of flow activities</td>
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</tbody>
</table>

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simulate experiences in the real business world and create a sense of competitive gaming that could help induce a state of flow in students. For a class on finance, a flipped classroom approach in which students manage a real or mock portfolio of investments during the class period and individually study the assigned learning material outside of the classroom could be utilized. Such examples are just a fraction of the myriad of ways flow experiences could be used by the instructor to enhance student learning.

Regarding the flow experience in particular, a sense of feeling in control and a sense of enjoyment are two important aspects that have positive effects on students’ perceptions of subject matter learning, skill development, and satisfaction. This suggests that instructors should strive to foster a sense of capability in students and set up a pleasant learning atmosphere. Contrary to expectation, the sense of the transformation of time had only small negative effects in our study on student satisfaction and perceived subject matter learning. This could indicate that students may not particularly desire to spend more time in class, at least not in the class format experienced in this study.

Examining the preconditions of flow experience in business classroom learning is very informative and can provide instructors with insights on how to structure learning activities to induce flow experience and use the idea of flow as a strategic tool. As all three preconditions (clear goal, feedback, and balance of challenge and skill) are important, addressing these aspects in business pedagogy teaching styles should be helpful. Clearly stated and measurable learning objectives for each lecture, activity, and task give students a sense of what to accomplish. More feedback regarding student performance on assigned work, exams, and projects as well as during classroom learning helps students gauge their learning progress. Feedback during a specific learning session can take on several different forms such as a mini-quiz in the middle of a session, open discussion-oriented questions involving understanding of previously introduced concepts, opportunities for students to raise questions, and even strategically placed pauses giving students a chance to reflect on the learning material. To better balance the level of challenge to the students’ skill levels echoes the requirement of “knowing your students.” A matching of difficulty of the subject matter to students’ ability is what we should strive for. For example, having a professor talk about derivatives and integrals to business students who have never taken calculus may run the danger of losing the attention of students—or worse, having them get discouraged and check out—rather than challenging them because the prerequisite mathematical hurdles are too high. Just as material that is too difficult for students to follow may be ineffective in teaching, presenting material that is considered too easy for students may not be perceived well by students either and runs the same danger of losing students’ attention and motivation. Students need to be taught subject matter with just the right amount of challenge and rigor to stimulate their interest, keep them moving forward, and build their confidence. Getting students to engage in flow during classroom learning with some of these suggestions presented above can accomplish much in strategically getting students motivated to learn.

Interestingly, our results show that there are three significant negative correlations—goal clarity on objective learning of subject matter (−.171), transformation of time on perceived learning of subject matter (−.083), and transformation of time on satisfaction (−.134). One possible explanation for the negative correlation between goal clarity and objective learning of the subject matter is that detailed multiple choice quiz questions were used to measure learning. It is possible that some students understood the goals/purpose of the lecture, but were unable to correctly answer the multiple-choice quiz questions. The relationship between transformation of time and student perceptions of outcomes could be affected by students’ underlying beliefs about effort and learning. When time seems to fly, students may mistakenly believe that their learning outcomes are relatively poor. In contrast to student beliefs, the relationship is not negative between the transformation of time and objectives measures of performance. This might explain the negative correlations between transformation of time and satisfaction and perceived learning of subject matter.

**Limitations and conclusions**

In this study, we have studied the interaction between the preconditions and dimensions of flow with learning outcomes. This research project is among the first to apply flow theory toward business education and capture a positive connection between the existence of flow in students and enhanced learning performance. Based on the results, we conclude that flow experience is a driver for student learning and can be aimed at enhancing the student learning experience to achieve better learning outcomes.

Although we discovered strong support for our hypotheses, this study is still not without its limitations. First, we acknowledge that the way we objectively measure learning may be improved with a more sophisticated prelearning and postlearning quiz instrument. Increasing the number of questions and varying the balance between qualitative and quantitative topics in the quiz instrument would better capture different nuances of any learning occurring during the classroom lecture. Second, flow is a multidimensional construct and there
exist other flow state scales that contain dimensions not utilized in our present study. For instance, the loss of self-consciousness dimension is a dimension that could be incorporated into a future study. Next, the validated flow instrument used in this project was originally created for capturing flow occurrence during more active and dynamic activities such as sports games (Jackson & Marsh, 1996) and human computer interaction (Chan & Ahern, 1999; Chan & Repman, 1999). It was not intended to be used in a lecture-oriented business classroom learning environment. As a result, the flow instrument may need to be further adapted and validated to better capture the occurrence of flow in this type of setting. Another limitation is that the study was conducted in a traditional classroom learning environment where the primary mode of instruction was a business lecture. It is quite possible to consider that the traditional lecture method of delivery in a traditional classroom is not stimulating or engaging enough to induce a strong state of flow. And as we desire to establish some relationship between flow and objective learning, future studies can be conducted with active experiments involving different research designs incorporating interactive activities and interactive technologies. Several studies on flow in a learning environment generally involved the use of more engaging tasks such as role-playing and simulation games (Kiili, 2005).

Given that our study does find links between students’ experience of flow and objective and subjective learning of subject matter, beneficial implications are apparent. It is true that flow provides intrinsic motivation for students in various learning activities (Csikszentmihalyi, 1988). And although our particular study did not find a direct link between students’ experience of flow and their learning performance, flow did play a large part in contributing to students’ sense of perceived learning, perceived skill development, and overall satisfaction. Therefore, flow may still provide a means of improving student learning and the quality of higher business education.

References


Appendix A : Questionnaire items

Demographics

Your age: 1. under 18  2. 18–19  3. 20–21  4. 22–23  5. 24 and up
Gender: 1. Female  2. Male
5. Other: __________ (please specify)

Past Performance

What’s your expected grade in the class?

Interest

I am interested in the subject areas taught in the course.

Perception of Instructor

The instructor is prepared and organized for lectures.
The instructor is sensitive to students’ feelings and problems.
The instructor is knowledgeable about material presented in class.
The instructor has the ability to help students think and learn.
The instructor presents course material in a clear manner.

Flow

Perceived Balance of Skill and Challenge

I believed my learning ability would allow me to meet the challenge of the lecture.
My learning skills and ability are at a high level.
My learning abilities matched the challenge of the lecture.
I felt I was competent enough to understand the key concepts.

Goal Clarity

I had a strong sense of what I wanted to learn.
I knew clearly what I wanted to learn.
I knew what I wanted to achieve for today’s lecture.
45. The goals of the lecture were clearly defined.

Feedback

It was really clear to me that I was learning the material well.
I was aware of how well I was learning the material.
I had a good idea throughout the lecture about how well I was learning.
I could tell by my understanding how well I was learning.

Concentration

My attention was focused entirely on the lecture.
It was no effort to keep my mind on what was happening in the class.
I was completely focused on the current lecture.
I had total concentration.

Sense of Control

I felt total comprehension of what I was learning.
I felt like I could control my learning during class.
I felt in total control of my mind.
I had a feeling of total control.

Transformation of Time

Time seemed to alter (either slowed down or speeded up).
It felt like time flew by during the lecture.
At times, it almost seemed like things were happening in slow motion.
The way time passed seemed to be different from normal.

Enjoyment

I really enjoyed the experience.
The learning experience left me feeling great. 
I loved the feeling of learning in this lecture and want to capture it again.
I found the learning experience extremely rewarding.

Self-Rated Flow
The word “flow” is used to describe a state of mind sometimes experienced by people who are deeply involved in some activity. Flow has been described as an intrinsically enjoyable experience.
I will say I was in flow.

Student learning outcomes

Satisfaction of the learning process
The objectives of the lecture have been accomplished.
I have learned a lot in the lecture.
The lecture was useful and relevant.

Perceived skill development
Entering into a partnership with other public agencies.
Participating in community-based partnership to address site or area-specific community needs.
Negotiating win-win strategies among competing public and private partners.

Perceived subject matter learning
I became more interested in the _________ concept.
I gained a good understanding of the _________ concept.
I learned to identify central ideas in the _________ area.
I developed the ability to communicate clearly about the _________ concept.
I was stimulated to do additional work in the area of _________.
My ability to critically analyze _________ issue was improved.
I found the current project to be a good learning experience.
Given a choice, I would take part in a project similar to the current project.

Objective outcome measure):
Five multiple choice questions related to the learning material of the class.