# Faculty Members' Perceptions of Their Classroom Practices in Developmental Mathematics

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*The purpose of this study was to determine faculty members' self-reported use and implementation of good practices in their developmental mathematics classrooms. Participants in this study were full-time or part-time (adjunct) mathematics instructors that taught developmental mathematics courses at two-year colleges. Participants completed a reduced form of an inventory developed in 1991 by a group of researchers. Comparisons of medians and boxplots indicated that most developmental mathematics faculty reported using most of the principles often or very often, but variability existed on several items. Active learning items were reported to be implemented less than other items.*

*Keywords: developmental mathematics, seven principles of good practice, faculty, adjunct faculty*

Community colleges often serve a large population of students who are not prepared to enroll in college-level math courses (Chen & Simone, 2016). Through developmental education programs, mathematics instructors strive to help these students become college-ready within one or two semesters. Attaining this goal is sometimes hampered because many students work full-time, attend college part-time, have had a delay since their last math course, and are faced with situational factors such as home, family, and employment responsibilities that serve as hurdles for adult learners (Cross, 1981; Horn & Nevill, 2006; Zientek et al., 2014). For this diverse population, faculty members determine best teaching practices to use in the classroom. While research on teaching has occurred across the K–16 curriculum, few studies have focused on community college mathematics instructors, particularly in developmental mathematics courses (Mesa et al., 2014). In this study, we explored developmental mathematics instructors' self-reported use of Chickering and Gamson's (1987) *Seven Principles of Good Practice in Undergraduate Education*.

## Problem Statement

Many students who require remediation have failed to reach the milestone of completing their mathematics courses; thus, developmental education programs have been challenged with improving success rates (Bahr, 2008). The instructor is important in meeting this challenge. Boylan et al. (1999) stated that "improving the quality of teaching available to developmental students cannot help but improve the quality of their learning" (p. 99). Smittle (2003) noted that the fundamental idea to successfully teaching developmental students is to guarantee that teaching practices do not deviate from the principles of effective teaching.

Faculty characteristics are reported in research but "very little is written about those who teach the…lower margins of community college curriculum" (Kiskar & Outcalt, 2005, p. 2). Preuss (2008) agreed when he stated that faculty characteristics frequently are not considered in developmental mathematics literature, especially with respect to student success. Research on developmental education teachers tends to focus on gender, age, full-time teaching status, highest degree earned, or higher education teaching experiences (Datray et al., 2014; Fike & Fike, 2007; Hunt, 2011; Kisker & Outcalt, 2005; Moss et al., 2014; Penny & White, 1998). Given a lack of research on instructors in developmental mathematics classrooms, we chose to explore developmental mathematics instructors' perceived use of good teaching practices. Collecting the faculty members' perspective on classroom teaching is of particular interest because they shape students' classroom experience (Moss et al., 2014). An educational significance of this study is to provide faculty members and administrators insight into developmental math instructors' self-perceived utilization of teaching principles. Self-reflections on using these principles can serve as guidelines to improve teaching and learning. Results from this descriptive study might be helpful in planning professional development for developmental mathematics faculty, particularly for novice faculty members who often have limited teaching experience or training in teaching and learning (Bonham & Boylan, 2012).

## Conceptual Framework: The Seven Principles

Chickering and Gamson (1987) published the *Seven Principles of Good Practice in Undergraduate Education*, based on "50 years of research on the way teachers teach and students learn, how students work and play with one another, and how students and faculty talk to each other" (p. 3). The task force that created the principles reflected on previous research and was influenced by a previous list of good practices for experiential learning (Chickering & Gamson, 1999). The principles were designed for faculty members' use because faculty have a long-lasting impact on improving undergraduate education (Gamson, 1991). Thus, the *Principles* provide a framework for faculty to improve instruction. The seven principles are to (a) encourage student-faculty contact, (b) encourage cooperation among students, (c) encourage active learning, (d) give prompt feedback, (e) emphasize time on task, (f) communicate high expectations, and (g) respect diverse talents and ways of learning (Chickering & Gamson, 1987).

### *Student-Faculty Contact*

Student-faculty contact, both in and out of the classroom, is important to student motivation and involvement (Chickering & Gamson, 1987). According to Galbraith and Jones (2006), when an instructor communicates in positive ways with students, it shows a caring attitude; and when humor and self-disclosure are used, trust is built. When instructors implement activities that provide opportunities to work one-on-one with students and when students are provided with the instructor's home phone number, students receive subtle messages that they are valued (Terrenzini et al., 1996). According to Cox (2015), the amount of student-teacher interaction can affect pass rates for students. When students have a connection with faculty, they tend to persist through difficult times and have a stronger commitment to their values and future plans (Chickering & Gamson, 1987). Astin (1984) claimed that frequent interaction between college students and their instructors was strongly related to students' satisfaction with college.

### *Cooperation Among Students*

Learning can be enhanced when students work together to learn with the guidance of an instructor (i.e., cooperative learning). Good learning should be collaborative, social, and non-competitive (Chickering & Gamson, 1987). When students share their ideas and interact with others, they increase their thinking skills and deepen their understanding. Cooperative learning allows students to share the responsibility for each other's success versus struggling alone (Hendrix, 1996). Sometimes fellow students can explain concepts using words that are more easily understood by their peers than explanations provided by instructors (Galbraith & Jones, 2006). Furthermore, students can learn better when they explain concepts to someone else (Cafarella, 2014). Another benefit of cooperative learning is the ability to accomplish humanistic educational goals such as improving attitudes toward school and peers (Hendrix, 1996).

### *Active Learning*

Incorporating active learning techniques has been a well-accepted pedagogical principle that promotes greater student learning. Chickering and Gamson (1987) stated that students do not absorb as much by sitting in lectures as they do when they are active learners. Boylan (2002) depicted active learning as students being dynamic participants in their studies rather than being inactive recipients. For learning to take place, students need to exchange ideas verbally and in writing, connect new knowledge to past knowledge, and utilize the new knowledge in their lives. This is important because learners do not store new information into long-term memory until the learner does something with that information (Svinicki & McKeachie, 2014). Active learning can take place in the classroom when students participate in discussions, group projects, and other activities, and it removes the "illusion of learning" that students have when they think they understand because they have emulated a problem with their instructor but cannot complete the homework (Svinicki & McKeachie, 2014, p. 192). Additionally, active learning can occur outside of the classroom when students participate in internships, independent study, or cooperative jobs (Chickering & Gamson, 1987).

### *Prompt Feedback*

Boylan (2002) stated that feedback allows students to organize their study more effectively and shows that instructors have made the effort to seriously review students' work. When feedback is prompt, students have an opportunity to change their academic behaviors and improve their learning before advancing to new topics. Feedback should be specific to allow students to learn from their errors and can be provided in several ways, including typical assessments, academic advising, portfolios, or revising and editing of writing (Chickering & Gamson, 1987).

### *Time Management*

According to Astin's (1984) student involvement theory, a student's ability to reach a goal is a "direct function of the time and effort they devote to activities" that produce the desired effect (p. 522). Thus, successful learning requires efficient time management skills and knowing how to allot a suitable amount of time for valuable learning, which some students do not possess when they enter college. Instructors can serve as a guide for students by defining time expectations for students (Chickering & Gamson, 1987). Students need this guidance because, for struggling students, course grades alone might not be the impetus needed to modify the amount of time they devote to their studies. In a longitudinal study, researchers Thibodeaux et al. (2017) concluded that how students spend their time is related to grade-point average (GPA). They found that students who exceeded their self-predicted GPA planned to increase the time they spent socializing, but students who did not meet their self-predicted GPA did not plan to increase the amount of time they spent on academics.

### *High Expectations*

Tinto (2012) stated that student success is influenced by the level of expectations teachers place on students and that "no one rises to low expectations" (p. 7). The highly cited Pygmalion study, where teachers were told that randomly selected students were in the top 20% and then those students outperformed their peers, demonstrates how high expectations can lead to greater success; albeit this effect primarily was for the lower elementary grades (Rosenthal & Jacobson, 1968). High-achieving, unmotivated, and underprepared students all benefit from high expectations. Lemov (2015) stated that high expectations are a reliable driver of high student achievement. As noted by Chickering and Gamson (1987), "expecting students to perform well becomes a self-fulfilling prophecy when teachers and institutions hold high expectations of themselves and make extra efforts" (p. 4–5).

### *Respect Diverse Learning Styles*

In their original publication, Chickering and Gamson (1987) described the diverse learning style principle as the unique ways students learn, such as being better with labs versus theory or seminars versus art studios. Some research now indicates that teaching to different learning styles does not have an empirical base (Rohrer & Pashler, 2012). Coffield et al. (2004) claimed that learning style awareness was only one piece of the learning process and concluded that "after more than 30 years of research, no consensus has been reached about the most effective instrument for measuring learning styles and no agreement about the most appropriate pedagogical interventions" (p. 150). However, another interpretation of this principle redeemed the applicability of it. Lidman et al. (1995) interpreted "diverse talents and ways of learning" to focus on respecting diversity and stressed the importance of diversity in light of our changing world. Lidman et al. (1995) provided three observations that impact American education systems: (a) the changing demographics in the student population, (b) the "international and interdependent character of our world" (p. 96), and (c) the appreciation of the varied ways people learn. Lidman et al. (1995) also suggested that education should focus on teaching the skills of learning, which corresponds to the definition of developmental education. Considering this new interpretation, we refer to "respect for diverse learning styles" as "respect diversity."

### *Faculty Inventory*

Within six months of the publication of the *Seven Principles*, over 150,000 copies of the bulletin were requested by institutions across the United States and abroad (Gamson, 1991). Due to the popularity of the *Seven Principles*, a faculty inventory was developed for self-evaluation by faculty to determine the extent to which they employ the *Seven Principles* with their undergraduate students (Gamson, 1991). Even though the *Seven Principles* faculty inventory was not intended to evaluate faculty by a third party, the inventory has been administered to study faculty members' utilization of the *Seven Principle*s among many disciplines, including online education (Batts, 2005), health and science education (Musaitif, 2013), undergraduate chemistry education (Bishoff, 2010), and learning communities (Cousins, 2012).

### Purpose of the Study and Research Question

A lack of research exists on teaching practices in developmental mathematics courses at community colleges (Mesa et al., 2014). The purpose of this study was to examine developmental mathematics faculty members' self-reported use of the *Seven Principles of Good Practice in Undergraduate Education* in their classrooms (Chickering et al., 1991). Knowing the extent to which instructors believed they used the principles of good practice can provide a foundation for future research and professional development. Administering the instrument to this sample allowed a sample of two-year college instructors to reflect on their teaching practices. This study will be guided by the following research question:

To what extent do developmental mathematics faculty self-report that they use items linked to the *Seven Principles of Good Practice* in their developmental mathematics courses?

## Method

### Participants

Participants in this study ($n$ = 142) were full-time or part-time mathematics instructors that taught developmental mathematics courses at two-year colleges. The sampling method for this study was purposive in that the goal was to find a group of developmental mathematics instructors who could provide informed survey responses (Johnson & Christensen, 2014). Recruitment was conducted through the (a) American Mathematics Association of Two-Year Colleges (AMATYC), (b) National Association of Developmental Education (NADE; now known as National Organization for Student Success (NOSS)), and (c) mathematics faculty from a large community college. After IRB approval, an email was sent to both AMATYC and NADE members. NADE also published the survey link on their Facebook page. The mathematics department dean at a large community college system in Texas was contacted to gain access to email addresses for mathematics faculty. All groups were emailed a request to participate.

### *Sample Characteristics*

Of the 142 faculty respondents, 71.1% were AMATYC members, 11.9% taught at the participating community college, 8.5% were NADE members, and 8.1% were other sources (i.e., Facebook, forwarded emails); 62.7% reported having a master's degree. Many of the faculty respondents (64.1%) reported teaching both developmental courses and college-level mathematics, and 80% of AMATYC and NADE members who responded were full-time. Nearly 70% of the respondents reported being female. See Table 1 for complete demographics.

**Table 1.** *Demographics and Background of the Participating Faculty Members*

| Highest Degree | *n* | Typical courses | *n* | Status | *n* | Gender | *n* | Age | *n* | Total Years | *n* | College Years | *n* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bachelor's | 17 | Dev Ed | 43 | Full-time | 113 | Male | 45 | *M* | 51 | *M* | 20 | *M* | 15.7 |
| Master's | 89 | College | 8 | Part-time | 25 | Female | 97 | *SD* | 12 | *SD* | 10 | *SD* | 10.1 |
| Doctorate | 36 | Both | 91 | | | | | | | | | | |
| Total *n* | 142 | | 142 | | 138 | | 142 | | 139 | | 141 | | 140 |

*Note*. Typical courses = the types of courses they typically teach; Dev Ed = developmental education; Total years = total years of teaching experience; College years = years of teaching experience at the college level; *M* = Mean; *SD* = standard deviation.

## Instrumentation

Participants in this study completed a modified form of the *Faculty Inventory for Good Practice*. The original inventory was a seven-section questionnaire, with each section connected to one of Chickering and Gamson's (1987) *Seven Principles of Good Practice in Undergraduate Education.* The inventory is free use and publicly available (Chickering et al., 1991). The *Faculty Inventory* was designed to be a self-evaluation instrument used by faculty across all disciplines at the undergraduate level and to enable faculty members to examine if their individual behaviors and practice aligned with the seven principles. The authors intended the *Faulty Inventory* to be most helpful as a diagnostic tool, but it can be used by individuals or groups in assorted ways. The *Faculty Inventory* is not neutral in that it expresses the point of view of the *Seven Principles*. It would be easy for participants to create a positive report; therefore, the usefulness of the inventory is contingent on the honesty of the respondents (Chickering et al., 1991).

### *Shortened Inventory*

Because of the length of the original instrument, characteristics of the population, and the possibility of survey fatigue, the instrument was shortened and modified to fit this population (see Appendix). Decisions for removing items were determined by the first author. Reasons for removing items included that the item (a) was not as applicable to developmental mathematics courses compared to other courses, (b) was covered by other items, (c) was not applicable to a large population of part-time students, or (d) might result in teachers responding to prescribed curriculum or delivery modes rather than their own teacher preferences. The latter would be true in computer-assisted classrooms such as an emporium model or adoption of prescribed curriculum that incorporates collaboration. We elaborate in the limitation section our omission of some items as a limitation and suggestions for administering the full instrument in future studies. Respondents rated their use on a 5-point Likert scale with a "1" = Never and "5" = Very Often. The use of the inventory in this study did not contradict the purpose of the inventory because faculty members' responses were not used to evaluate individual faculty but rather described self-reported practices. Self-reported data frequently have been used to measure attitudes and values (Kuh & Vesper, 1997).

## Data Analysis

Several studies that administered the *Seven Principles Inventory* did not conduct a factor analysis, but assumed the items aligned to the respective factors (Bishoff, 2010; Musatif, 2013). Because of the small sample and the reduction of items, we made the assumptions that the items aligned with the original factors and reported descriptive statistics at the item-level instead of creating mean composite scores. Sample sizes, means, medians, and boxplot illustrations for each item were provided.

## Results

### Faculty Members' Perceived Use of the Principles

Boxplot comparisons were provided to illustrate the spread of our discrete data (i.e., 1, 2, 3, 4, 5) by principal item. Boxplots divide data into quarters. Medians are represented by darker horizontal lines, which together with the spread of the boxes illustrate the spread of data. Outliers are represented by either asterisks or circles. If data were skewed to the right (i.e., toward more often), then the mean will be much lower than the median and vice versa if the data are skewed in the other direction. Because histograms can provide further evidence of responding patterns, particularly when there are multiple peaks or minimal variance between ratings, we reported histograms in cases where we determined the histograms provided additional information not provided by the boxplots.

#### *Boxplot Comparisons of SFC and CAS*

For student-faculty contact (SFC), boxplot comparisons in Figure 1 demonstrated that almost all of the faculty members indicated that they encouraged "students to ask questions" (SFC 1) and that they shared their "past experiences, attitudes, and values with students" (SFC 2; Chickering & Gamson, 1991, p. 78). Medians for SFC 3 and SFC 4 indicated that approximately 50% of the faculty responded with a 4 or a 5 that they often knew their students' names within the first two weeks (SFC 3) or served in a mentoring capacity (SFC 4). Descriptive statistics in Table 1 indicate that the mean ratings for SFC items were above 4.

**Figure 1.** *Boxplot Comparisons for Instructors' Perceived Use of Student-Faculty Contact (SFC) Items*

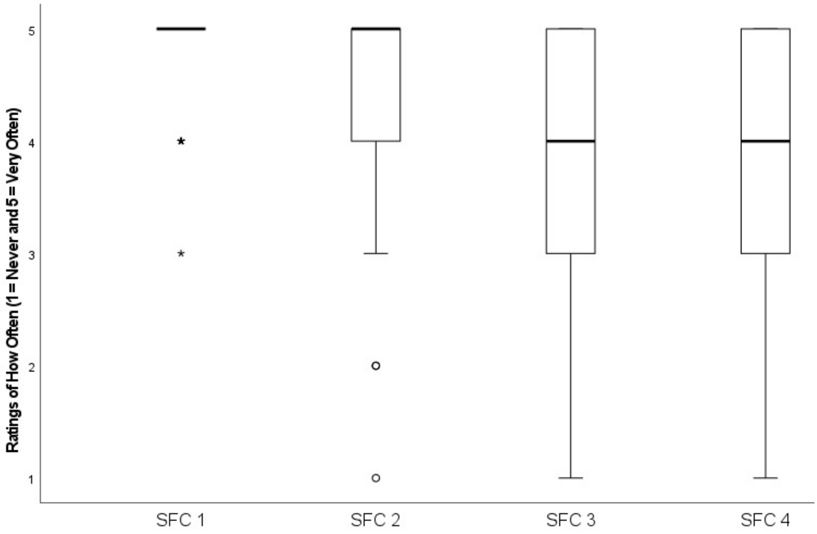



**Table 1.** *Descriptive Statistics for Student-Faculty Contact Items*

| | Respondents | | Missing | Descriptive Statistics | | |
|---|---|---|---|---|---|---|
| | *N* | Percent | *N* | Mean | SD | Median |
| SFC 1 | 142 | 100.00% | 0 | 4.937 | 0.27 | 5 |
| SFC 2 | 142 | 100.00% | 0 | 4.444 | 0.81 | 5 |
| SFC 3 | 142 | 100.00% | 0 | 4.028 | 1.04 | 4 |
| SFC 4 | 142 | 100.00% | 0 | 4.099 | 1.05 | 4 |

As seen in Figure 2, compared to SFC, responses indicated more variability for the cooperation among students (CAS) items. At least half of the developmental mathematics faculty indicated they very often encouraged their "students to prepare together for classes or exams" (CAS 2). Lower medians and the spread of boxplots for CAS 3 and CAS 5 indicated that faculty members were less inclined to encourage their students to "evaluate each other's work" or "praise each other for their accomplishments" (Chickering & Gamson, 1991, p. 79). The percentage of responses that gave a rating of 3 for those items were 29.1% for CAS 1, 24.8% for CAS 3, and 26.1% for CAS 5.

**Figure 2.** *Boxplot Comparisons for Instructors' Perceived Use of Cooperation Among Student Items*

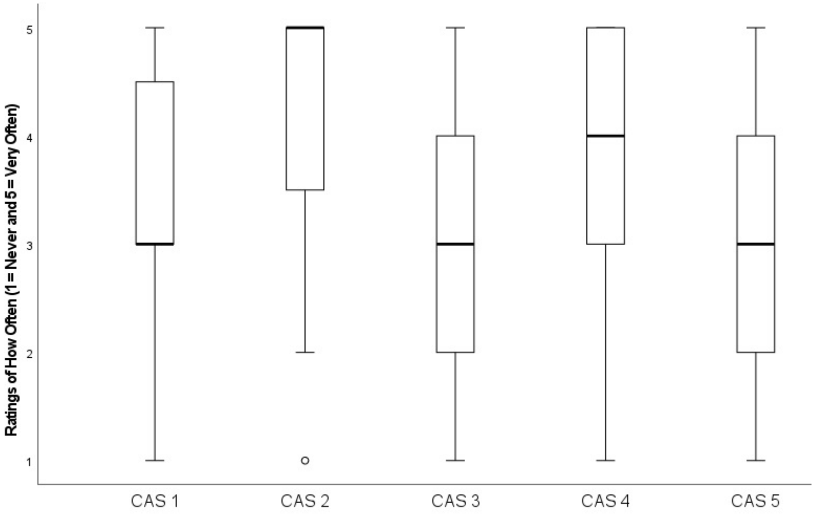



**Table 2.** *Descriptive Statistics for Cooperation Among Student Items*

| | Respondents | | Missing | Descriptive Statistics | | |
|---|---|---|---|---|---|---|
| | *N* | Percent | *N* | Mean | SD | Median |
| CAS 1 | 141 | 99.30% | 1 | 3.376 | 1.27 | 3 |
| CAS 2 | 141 | 99.30% | 1 | 4.206 | 1.02 | 5 |
| CAS 3 | 141 | 99.30% | 1 | 2.787 | 1.30 | 3 |
| CAS 4 | 142 | 100.00% | 0 | 3.831 | 1.19 | 4 |
| CAS 5 | 142 | 100.00% | 0 | 3.021 | 1.30 | 3 |

The histogram in Figure 3 illustrates that even though the mean for CAS 1 was less than 4, many teachers rated their use of CAS 1 as high (i.e., 4 or 5). The boxplot supports the histogram but the number of teachers who reported a 3 was lost in the boxplot illustration. Based on comparisons of means, medians, and boxplots, CAS 2 was skewed. Descriptive statistics in Table 2 indicated that the mean rating for CAS 3 was below 3. The histogram in Figure 4 shows that the majority of the students responded to CAS 3 with a 2 or a 3.

**Figure 3.** *Histogram for CAS 1*

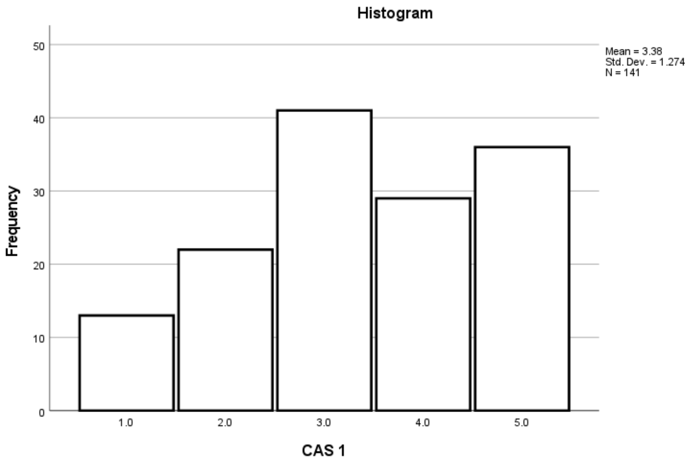
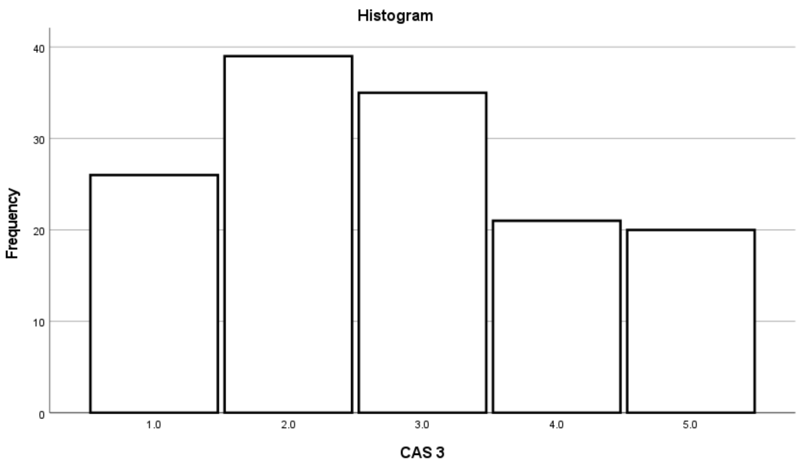



**Figure 4.** *Histogram for CAS 3*




## *Boxplot Comparisons of AL, and PF*

Boxplots in Figure 5 illustrate the medians were 3 for four of the active learning (AL) items. Encouragingly, the majority of faculty members reported they provided students with concrete, real-world problems. Our curiosity made us examine the correlations of AL items which were correlated at the $p < 0.001$ level with the highest correlations between AL 3 and AL 4 ($r^2 = 0.355$) and AL 1 and AL 2 ($r^2 = 0.173$).

**Figure 5.** *Boxplot Comparisons for Instructors' Perceived Use of Active Learning (AL) Items*

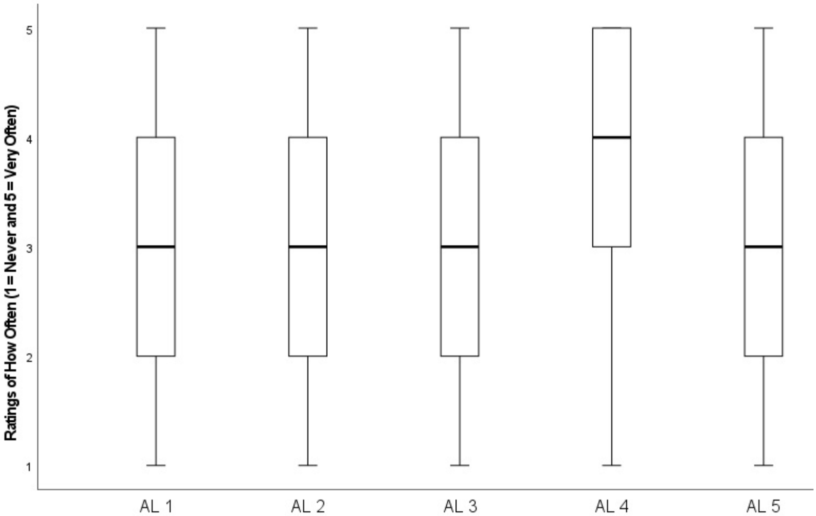
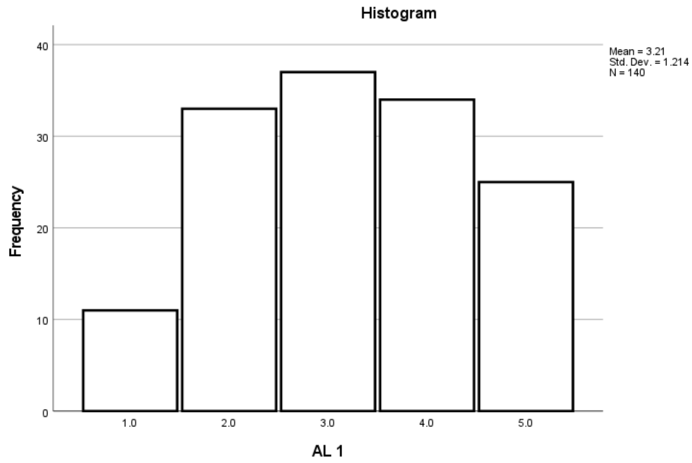



**Table 3.** *Descriptive Statistics for Active Learning Items*

| | Respondents | | Missing | Descriptive Statistics | | |
|---|---|---|---|---|---|---|
| | *N* | Percent | *N* | Mean | SD | Median |
| AL 1 | 140 | 98.60% | 2 | 3.207 | 1.21 | 3 |
| AL 2 | 141 | 99.30% | 1 | 3.206 | 1.19 | 3 |
| AL 3 | 137 | 96.50% | 5 | 3.299 | 1.18 | 3 |
| AL 4 | 141 | 99.30% | 1 | 3.823 | 1.04 | 4 |
| AL 5 | 141 | 99.30% | 1 | 2.929 | 1.29 | 3 |

Descriptive statistics in Table 3 indicate that the mean rating for all of the AL items was close to 3, except for AL 4. Even though the boxplot for AL 1 is symmetric, the histogram in Figure 6 illustrates more faculty members provided a rating of 5 than 1.

**Figure 6.** *Histogram for AL 1*




Boxplots in Figure 7 illustrate the median was 5 for three of the prompt feedback (PF) items. The PF 1, PF 2, and PF 3 items were highly skewed with most doing so "very often," which indicated assessment feedback was given often and feedback was provided within a week. In comparison, many developmental mathematics faculty were not as inclined to ask their "students to schedule conferences with" them "to discuss their progress" (PF 4; Chickering & Gamson, 1991, p. 81).

**Figure 7.** *Boxplot Comparisons for Instructors' Perceived Use of Prompt Feedback (PF) Items*

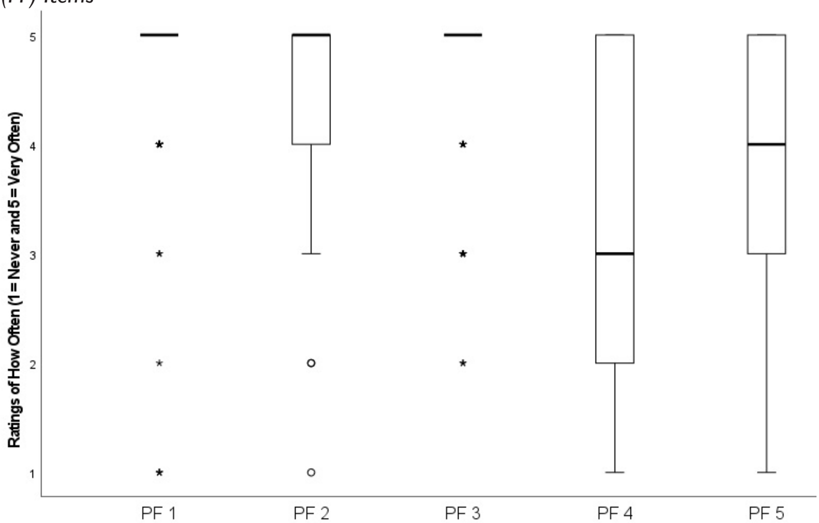


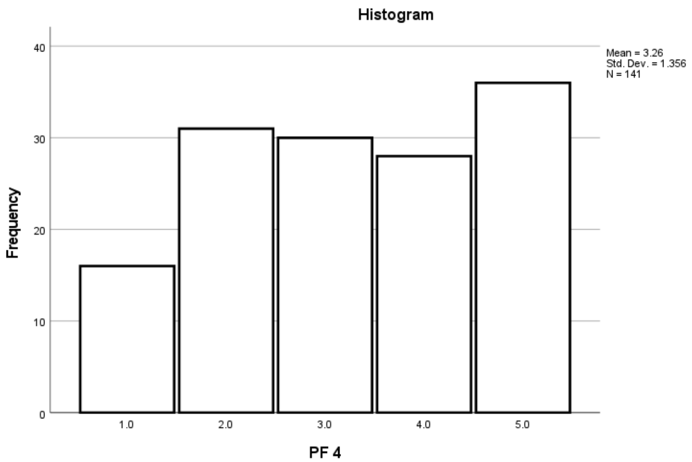
**Table 4.** *Descriptive Statistics for Prompt Feedback (PF) Items*

| | Respondents | | Missing | Descriptive Statistics | | |
|---|---|---|---|---|---|---|
| | *N* | Percent | *N* | Mean | SD | Median |
| PF 1 | 141 | 99.30% | 1 | 4.745 | 0.72 | 5 |
| PF 2 | 140 | 98.60% | 2 | 4.536 | 0.76 | 5 |
| PF 3 | 140 | 98.60% | 2 | 4.807 | 0.59 | 5 |
| PF 4 | 141 | 99.30% | 1 | 3.262 | 1.36 | 3 |
| PF 5 | 141 | 99.30% | 1 | 3.681 | 1.31 | 4 |

Descriptive statistics in Table 4 indicate that the mean rating PF 4 and PF 5 were below 4.

As seen in Figure 8, the low mean for PF 4 is because the number of faculty members who responded with a 2, 3, or 4 were relatively equal. Approximately 35 faculty members provided a rating of 5.

**Figure 8.** *Histogram for PF 4*




### *Boxplot Comparisons of TM, HE, and RD*

Boxplot items for time management (TM), high expectations (HE), and respect diversity (RD) items are provided in Figures 9–11. Four of the five TM items were skewed with median score at a 5, suggesting faculty "very often" performed these practices, although TM 4 (i.e., requiring students to make up missed work after an absence) had more variability than TM 1, TM 2, and TM 3. Descriptive statistics in Table 5 were lower than 4 for TM 4 and TM 5. Comparisons of means, medians, and boxplots provide evidence that ratings for TM 4 were skewed.

**Figure 9.** *Boxplot Comparisons for Instructors' Perceived Use of Time Management (TM)*

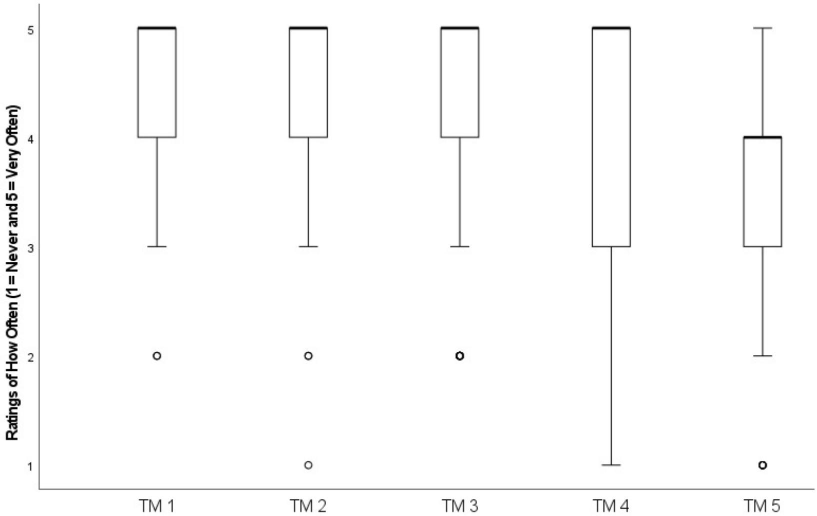



**Table 5.** *Descriptive Statistics for Time Management (TM) Items*

| | Respondents | | Missing | Descriptive Statistics | | |
|---|---|---|---|---|---|---|
| | *N* | Percent | *N* | Mean | SD | Median |
| TM 1 | 137 | 96.50% | 5 | 4.540 | 0.72 | 5 |
| TM 2 | 138 | 97.20% | 4 | 4.623 | 0.75 | 5 |
| TM 3 | 138 | 97.20% | 4 | 4.442 | 0.84 | 5 |
| TM 4 | 138 | 97.20% | 4 | 3.884 | 1.39 | 5 |
| TM 5 | 138 | 97.20% | 4 | 3.565 | 1.11 | 4 |

For HE, boxplots in Figure 10 illustrate that at least half of the respondents gave a 5 for items HE 1 and HE 2, indicating they "very often" explained to students the work expectations for the class were high and how high academic standards were important. Nearly all of the responses ranked HE 3 as "very often," indicating that their expectations were made early in the semester both in written and oral formats. HE 4 had the lowest median in regards to publicly calling attention to excellent performance. HE 5 had the second-most variability for HE items, with many reporting a 4 or 5 that throughout the semester they discussed how well the class is doing. Descriptive statistics are provided in Table 6.

**Figure 10.** *Boxplot Comparisons for Instructors' Perceived Use of High Expectations (HE)*

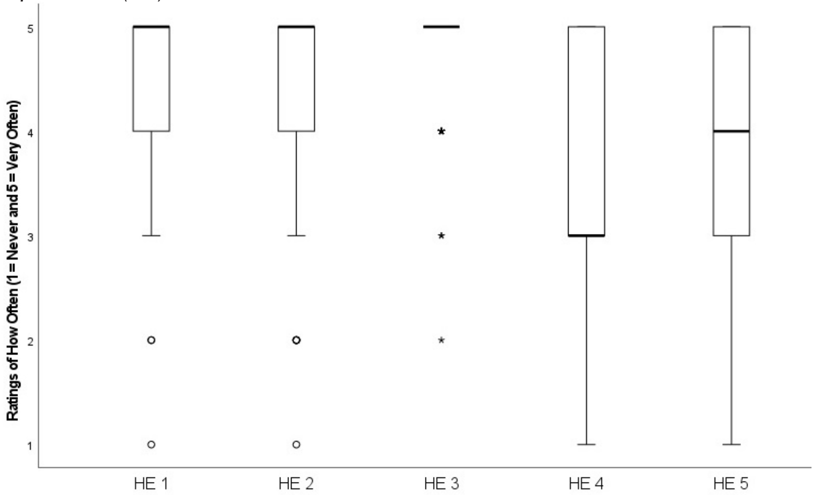



**Table 6.** *Descriptive Statistics for High Expectation (HE) Items*

| | Respondents | | Missing | Descriptive Statistics | | |
|---|---|---|---|---|---|---|
| | *N* | Percent | *N* | Mean | SD | Median |
| HE 1 | 140 | 98.60% | 2 | 4.550 | 0.74 | 5 |
| HE 2 | 139 | 97.90% | 3 | 4.453 | 0.88 | 5 |
| HE 3 | 140 | 98.60% | 2 | 4.821 | 0.47 | 5 |
| HE 4 | 141 | 99.30% | 1 | 3.369 | 1.29 | 3 |
| HE 5 | 140 | 98.60% | 2 | 3.843 | 1.13 | 4 |

Nearly all faculty members reported that they practiced the RD 1 and RD 2 items with 91% of the responses rating RD 1 as a 5 and 73% rating RD 2 as a 5, which means they encouraged students to ask questions on topics that they did not understand and discouraged disrespect in the classroom. Also high were RD 3 and RD 5 with a median of 4, which indicated that at least 50% of the responses ranked those items as a 4 or 5. Compared to the other RD items, they were less likely to use activities in their teaching that address an underrepresented group of students (i.e., RD 4). As seen in Table 7, the mean ratings were almost 5 for RD 1. Even though the mean for RD 4 was lower than 3.5, the median and histogram in Figure 4 indicates many faculty members rated RD 4 as a 4 or a 5.

**Figure 11.** *Boxplot Comparisons for Instructors' Perceived Use of Respective Diversity (RD)*

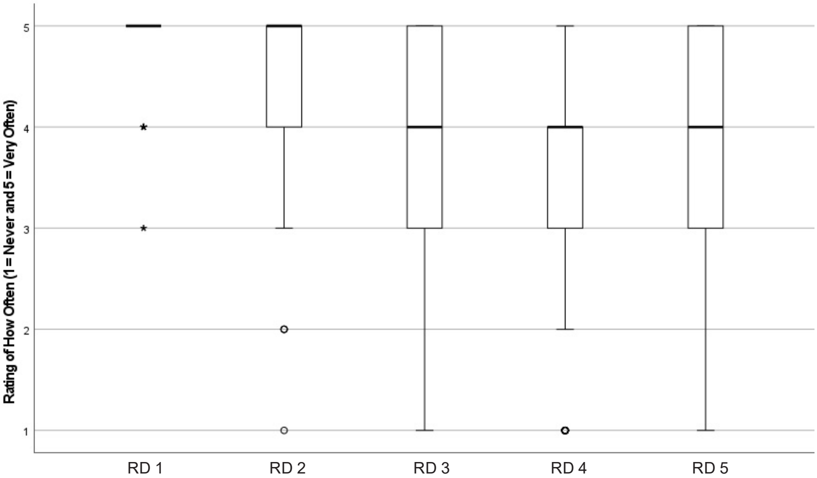
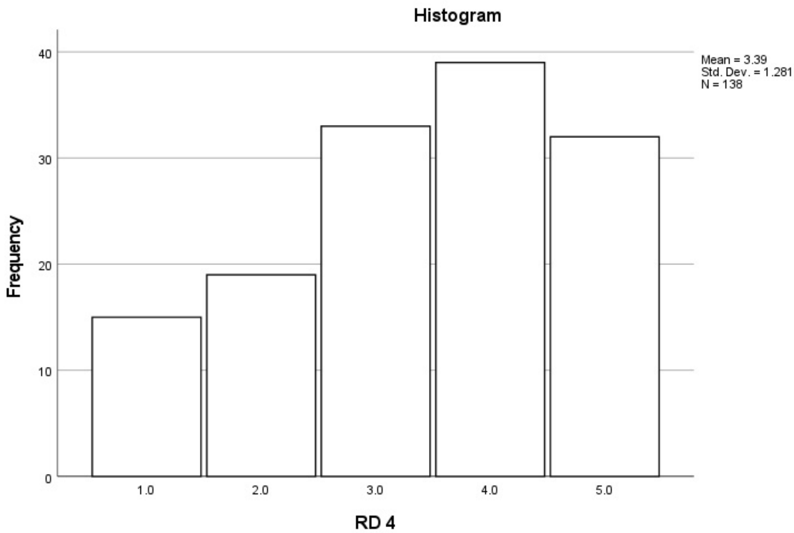



**Table 7.** *Descriptive Statistics for Respect Diversity (RD) Items*

| | **Respondents** | | **Missing** | **Descriptive Statistics** | | |
|---|---|---|---|---|---|---|
| | *N* | Percent | *N* | Mean | SD | Median |
| RD 1 | 138 | 97.20% | 4 | 4.899 | 0.35 | 5 |
| RD 2 | 139 | 97.90% | 3 | 4.583 | 0.80 | 5 |
| RD 3 | 138 | 97.20% | 4 | 4.043 | 1.12 | 4 |
| RD 4 | 138 | 97.20% | 4 | 3.391 | 1.28 | 4 |
| RD 5 | 138 | 97.20% | 4 | 4.007 | 1.11 | 4 |

**Figure 12.** *Histogram for RD 4*




## Discussion

When Chickering and Gamson developed the *Seven Principles for Good Practice in Undergraduate Education* in 1987, they claimed these principles were applicable to all content areas and provided a framework for instructors to evaluate and improve their teaching skills. In this study, developmental mathematics instructors evaluated their use of the seven principles on a subset of the faculty inventory items. Our findings primarily captured the responses of full-time faculty members. Most developmental mathematics faculty members reported using the teaching principles, albeit with some variability on items. Results indicate a need for promoting active learning strategies and cooperation among students.

### Active Learning

Providing students with active learning strategies has been emphasized by the Conference Board of the Mathematical Sciences (Braun et al., 2017). Many instructors in this study reported they were asking their students to analyze real-world scenarios. Interestingly, there was a relationship between giving real-life scenarios and asking students to relate events outside of the classroom to the course topics (i.e., AL 3 and AL 4). Implementation of items AL 1, AL 2, and AL 5 were discouraging with well over half of the faculty members reporting that they were less inclined to implement these items.

Zbiek and Larson (2015) illustrated the importance of integrating active learning techniques into mathematics courses, specifically algebra. Zbiek and Larson (2015) stated that teachers should realize the benefits students can receive from reviewing both correct and incorrect solutions to problems, which can be accomplished by students' presentation of work (i.e., working problems at the board). Yet many developmental math students might not be presenting their work to their peers (AL 1), with 41.9% of instructors rating this as a 4 or a 5, or comparing and contrasting different mathematical methods (AL 2), with 39.7% of instructors rating this as a 4 or a 5. Zbiek and Larson (2015) reported that some teachers will not teach multiple strategies because they believe this will confuse students and countered that with "the goal of teaching alternative strategies is not mastery of all strategies by all students but the individual student's mastery of the strategies that he or she chooses to use" (p. 698). The restrictions of the academic calendar and the large quantity of material to be covered keeps the lecture model an economical mode of instruction (Brown & Ellison, 1995). With lectures, students advance from concept to concept, often not making connections with what they are learning. A Pearson correlation coefficient indicated a somewhat noteworthy relationship between AL 1 and AL 2. Future studies should be conducted on active learning in courses for struggling students. For example, one hypothesis for why students were not asked to present work to the class might be because of students' reluctance to present work or the instructor's concern about raising mathematics anxiety levels among a group of students already exhibiting signs of anxiety. Future research could examine whether or not these items were not capturing the active learning practices that were incorporated in developmental mathematics classrooms.

## Student-Faculty Contact and Prompt Feedback

A robust body of research confirms the value of student-faculty contact, and the simple concept of feedback is powerful in driving the learning process. Chickering and Gamson (1987) enumerated student-faculty contact as the leading principle and declared it "the most important factor of student motivation" (p. 4). Faculty members in this study indicated that they often encouraged student-faculty contact. They were encouraging students to ask questions, learning their students' names early in the semester, disclosing previous experiences, communicating their viewpoints and standards, and serving as informal advisors. The means of all of the four SFC items were above 4.0.

Boylan (2002) claimed that instructors providing immediate feedback was a best practice for developmental students. Furthermore, Boylan (2002) and Benson et al. (1995) posited that students need specific feedback about what is right and wrong. Faculty members in this study reported they were very often providing their students with quizzes and homework, preparing classroom exercises to give immediate feedback, and returning exams within a week. Some faculty members were somewhat less inclined to provide written comments on exams that identified students' strengths and weaknesses (PF 5), but that result was skewed with a median of 4. It would be interesting to find out if some instructors did not mark this item high because their classroom assessments were computer-based homework and exams where students were provided immediate feedback within the testing system. Assessment practices, particularly as online systems are becoming more abundant in developmental mathematics classrooms, is an area for future research. Of all the PF items, boxplot comparisons and descriptive statistics indicated that faculty members were less likely to schedule conferences with students to discuss their progress (PF 4). Interestingly, the histogram illustrates that hidden within those measures is a relatively consistent number of responses for ratings 2 to 5. We hypothesize two possible explanations for this pattern of responses. Some instructors with a large population of part-time students might find it more challenging to schedule conferences with all of their students. Furthermore, responses might have been different had the question been limited to referencing underperforming students to set up a time to discuss their progress.

## High Expectations

Chickering and Gamson (1987) declared the day-to-day expectations faculty members and students hold for themselves and each other are the most important aspect of high expectations. According to Scott and Tobe (1995), "all students can do better, even if not equally well, and the role of the teacher is to encourage improvement, not expect equal results of all" (p. 81). Participating faculty members very often expressed their expectations for hard work, emphasized the value of high standards for academic success, and provided written and oral expectations at the beginning of each course. Periodic discussion of the class performance was rated with less frequency. In this study, teachers were less likely to report that they often publicly give notice to excellent performance by their students (HE 4), which could be considered a positive as this suggests faculty members were not using a performance approach. Midgley et al. (2000) defined performance approaches to instruction as "teacher strategies that convey to students that the purpose of engaging in academic work is to demonstrate competence" (p. 37). For some students, public praise for their performance can be a negative experience that causes stress or anxiety, especially for those that are intrinsically motivated.

## Respect Diversity

Classroom environment is important to learning. Understanding that each student has unique talents is essential to cultivating an environment of respect. Faculty members indicated they respected diversity by reporting that they very often or often incorporated behaviors that foster respect, such as urging students to pose questions when they have uncertainties with the material, discouraging behaviors that embarrass other students, using diverse teaching activities, and finding out about their students' interests and backgrounds. The low mean for integrating new information about underrepresented populations was due to the data being skewed, as seen in Figures 11 and 12.

## Time Management

The concept of time management intuitively makes sense. However, it is not simply the amount of time spent studying, but the quality of time. Faculty members in this study reported encouraging time management skills. Faculty members expected that assignments were completed promptly and emphasized to students the importance of steady work, continual application, self-pacing, and scheduling. While many allowed students to complete missed assignments, the results varied. Even though the mean was lower for meeting with students who were struggling to discuss time management strategies, the median of 4 indicated at least 50% of the participants met with students to help determine how better to balance their workload. Research has indicated that one of the most important predictors of academic success is attending class (Albert et al., 2018; Credé et al., 2010; Zientek et al., 2013). In this study, many faculty members indicated that they explained to students the repercussions of not attending class, which we interpret as explaining the importance of attendance. In the future, a question should be added to determine if instructors explain the benefits of attendance in addition to the negative outcomes of non-attendance.

## Cooperation Among Students

Chickering and Gamson (1987) believed "learning is enhanced when it is more like a team effort than a solo race" (p. 4). When students work together, it helps both the students who understand and the students who are struggling (Hatfield & Hatfield, 1995; Svinicki & McKeachie, 2014). In regard to CAS, the responses varied across items. Many faculty members sought to foster cooperation among students by encouraging them to study together (CAS 2). Many faculty members also appeared to have students explain ideas that were considered difficult (CAS 4) to each other. Although only those two CAS items had a mean above 3.8, we considered those results encouraging because students can improve their learning through those peer experiences (Hendrix, 1996; Galbraith & Jones, 2006; Hendrix, 1996).

Instructors' encouragement of students to share their interests and backgrounds was somewhat mixed. Faculty members reported a lower frequency of encouraging students to learn about their peers' interests and backgrounds, but the data appears skewed with more positively responding to that item. Faculty members reported less often to having students evaluate each other's work or encouraging peers to praise each other's accomplishments. Hatfield and Hatfield (1995) stated that peer evaluation helps students improve their critical thinking skills. Furthermore, encouraging students to learn about each other and reassuring each other's accomplishments through authentic peer praise supports the development of community, which Boylan (2002) claimed aids in student retention.

## Limitations

There were several limitations in this study. First, the sample was limited to faculty members' willingness to participate. Second, calculations of response rates were not possible because invitations were sent out through national organizations and shared among colleagues; thus, response rates were not known and the findings might not be generalizable to the population of developmental math teachers. Third, faculty members self-reported their behaviors, which might have resulted in skewed data if faculty members were overly generous or too critical in their responses. A final limitation is the modification of the instrument. In particular, we wish we had included the SFC items on culture or race and encouraging students to drop by the office. Additionally, nearly 80% of respondents reported being employed full time, which supports the idea posited by Eney and Davidson (2006) that more full-time faculty become members of professional organizations. Therefore, adjunct instructors might be underrepresented.

## Implications and Conclusion

As noted by Boylan (2002), "the quality of classroom instruction is the single most important contributor to the success of developmental students" (p. 68). A key element in evaluating the classroom environment is reflection. Community college instructors in this study were given an opportunity to reflect on their practices. These self-reflections can help instructors improve their teaching and disclose areas needed for professional development. In this study, faculty members' self-reporting of their practices from the *Seven Principles of Good Practice* inventory (Chickering & Gamson, 1991) provided evidence that more initiatives and training should be implemented to increase the use of strategies that encourage active learning and cooperation among students. Faculty members tended to provide prompt feedback, communicate high expectations, and encourage faculty-student contact, but were less inclined to ask students to meet with them to discuss their progress. Responses varied on the frequency of discussing time management strategies with struggling students. Future research should consider the following: (a) using all or more items from the original inventory, (b) using a different instrument, and/or (c) including a qualitative examination of what instructors are doing in their courses that promote the seven principles. Future research should also consider the quality of prompt feedback with the evolution of technology that makes communication more immediate.

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## Appendix

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|---|
| Please complete the survey as honestly as possible. Answer the questions in reference to DEVELOPMENTAL MATHEMATICS courses you are teaching this semester. Rate each question between 1 and 5 with 1 being something you NEVER do and 5 being something you do VERY OFTEN. |
| SFC 1 I encourage students to ask questions.* |
| SFC 2 I share my past experiences, attitudes, and values with students. |
| SFC 3 I know my students by name by the end of the first two week of the term. |
| SFC 4 I serve as a mentor or informal advisor to students. |
| **Cooperation Among Students** |
| CAS 1 I ask students to tell each other about their interests and backgrounds. |
| CAS 2 I encourage my students to prepare together for classes or exams. |
| CAS 3 I ask my students to evaluate each other's work. |
| CAS 4 I ask my students to explain difficult ideas to each other. |
| CAS 5 I encourage my students to praise each other for their accomplishments. |
| **Active Learning** |
| AL 1 I ask my students to present their work to the class. |
| AL 2 I ask my students to summarize similarities and differences among different mathematical methods.* |
| AL 3 I ask my students to relate outside events or activities to the topics covered in my courses.* |
| AL 4 I give my students concrete, real-life situations to analyze. |
| AL 5 I use simulations, role-playing, or labs in my classes. |
| **Prompt Feedback** |

| |
|---|
| PF 1 I give quizzes and homework assignments. |
| PF 2 I prepare classroom exercises and problems which give students immediate feedback on how well they do. |
| PF 3 I return examinations and papers within a week. |
| PF 4 I ask my students to schedule conferences with me to discuss their progress. |
| PF 5 I give my students written comments on their strengths and weaknesses on exams and papers. |
| **Time Management** |
| TM 1 I expect my students to complete their assignments promptly. |
| TM 2 I underscore the importance of regular work, steady application, sound self-pacing, and scheduling. |
| TM 3 I explain to my students the consequences of non-attendance. |
| TM 4 If students miss my class, I require them to make up lost work. |
| TM 5 I meet with students who fall behind to discuss their study habits, schedules, and other commitments. |
| **High Expectations** |
| HE 1 I tell students that I expect them to work hard in my classes. |
| HE 2 I emphasize the importance of holding high standards for academic achievement. |
| HE 3 I make clear my expectations orally and in writing at the beginning of each course. |
| HE 4 I publicly call attention to excellent performance by my students. |
| HE 5 I periodically discuss how well we are doing during the course of the semester. |
| **Respect Diversity** |
| RD 1 I encourage my students to speak up when they don't understand. |
| RD 2 I discourage snide remarks, sarcasm, kidding, and other behaviors that embarrass other students. |
| RD 3 I use diverse teaching activities to address a broad spectrum of students. |
| RD 4 I integrate new knowledge about underrepresented populations into my courses. |
| RD 5 I find out about my students' interests or backgrounds at the beginning of each course. |

*Questions modified from original inventory.