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Students' Perceived Importance of Good Practices in Undergraduate Education: How Different are the Pure and Applied Sciences?

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Abstract
This study explored university students' perceived importance of the Seven Principles of Good Practices in Undergraduate Education (SPGPUE) as proposed by Chickering and Gamson in 1987. 1,706 respondents participated in the study and were grouped according to gender, year-level and academic discipline. Disciplines apart from pure and applied sciences were likewise included for comparison purposes. Factorial multiple analysis of variance was employed to identify significant effects and correlation of students ranking of the SPGPUE. Results indicated that students generally perceive all of the seven principles as equally important regardless of their gender, year-level and discipline or specialization. However, closer examination using the results from tests in-between subjects effects revealed a number of significant differences such that significant correlations exist between discipline classification and cooperative learning; discipline classification; and gender to cooperative learning. Moreover, it was also found out that a significant difference in the rating of importance of faculty contact exists when the respondents are grouped according to gender and year-level. Implications of the results of the study in the area of curriculum development and the teaching of science in undergraduate education is discussed.

1. Introduction
Constructivism as a theory of learning has achieved dominance since the late 1980's and has been a major anchor of almost all major curricular reforms. Whereas there are a number of variations of constructivism as contextualized in different disciplines (Fosnot, 1996; Yilmaz, 1998; Johnson, 2009), all of these variations agree on the important role that learners play in knowledge construction and meaning-making. As an extension, it is therefore important to take into consideration the input and preferences of learners as to how the teaching-learning process is carried out in order to optimize learning and systematize the process of instruction. In contemporary times, the teaching-learning process is largely dictated by interactions among the learners, the teacher, and the material or process of interest. Moreover, there are identified good practices in teaching undergraduate education (Chickering and Gamson, 1987) that may be utilized as a framework to draw and integrate student input on how instruction may be planned and implemented to maximize learning.

1.1 The Seven Principles of Good Practices in Undergraduate Education
SPGPUE is a synthesis product of both empirical and theoretical literature offered by Chickering and Gamson that first came out in 1987. The synthesis asserts that good practice in undergraduate education (a) encourages faculty contact, (b) encourages cooperation among students, (c) encourages active learning, (d) gives prompt feedback, (e) emphasizes time on task, (f) communicates high expectations, and (g) respects diverse talents and learning. Over the years, a considerable volume of literature pertinent to the SPGPUE emerged. Most studies used SPGPUE as framework for course development and assessment in the context of distance and online program offerings (Caplan and Graham, 2004; Grant and Thornton, 2007). This is understandable since distance learning through online courses lacks the face to face contact that usual classroom encounters afford to both learners and teachers. There are also some studies that utilized SPGPUE as a framework for strategic learning interventions (Simkins and Maier, 2004; Shea, Fredericksen, Pickett & Pelz, 2004)) as well as in institutional and faculty development (Ouellett, 2004).

1.2 Classification of Academic Disciplines
Higher education in general follows a relatively structured process of granting a certain academic degree. In an attempt to create a qualifying framework of the different disciplines, Biglan (1973) proposed a certain scheme called Classification of Academic Disciplines. The classification primarily ontologically and epistemologically-based since the bases include what the members of the discipline

generally believe or collectively hold true. The classification groups the different academic disciplines as either 'soft or hard' that is equivalent to paradigmatic and pre-paradigmatic disciplines or generally natural sciences and humanities/social sciences. The classification also divides the discipline whether it is purely theoretical or applied as well as whether it deals with living or 'life'; or 'non-life'

2. Methodology

The current study is exploratory in nature and utilized survey as the primary mode of data acquisition since it intends to collect the respondents' personal preferences ((Fink, 2003). The main instrument used in the study is based on the original instrument developed by Aydoğdu, Doymuş, & Şimşek (2012). The developed instrument was pilot-tested to 230 university students. Construct validation was performed using confirmatory factor analysis with varimax rotation and exclusion of factor loadings lower than 0.25. Only 18-items were retained composed of four items for principle 1 (Encourage Faculty Contact), three items for principle 2 (Encourage Cooperation Among Students), two items for principle 3 (Encouraging Active Learning), three items for principle 4 (Giving Prompt Feedback), and two items each for principles 5 (Emphasizing Time on Task), 6 (Communicating High Expectations), and 7 (Respecting Diverse Talents or Ways of Learning). The overall explained variance of the modified instrument is 56.8% and is deemed relatively acceptable given the number of factors being investigated (Beavers et al., 2013) with a Cronbach alpha of 0.71.

3. Results and Discussion

3.1 General Description of Respondents

Majority respondents (53%) are female. With respect to year level, there were 400 freshmen, 393 sophomores, 445 juniors, 323 seniors and 145 fifth years. As regards to the number of respondents according to Biglan's classification, 69 respondents come from pure hard life (PHL), 39 applied soft life (ASL), 424 pure hard non-life (PHN), 470 applied hard non-life (AHN), 30 pure soft life (PSL), 334 applied soft life (AHL), 74 pure soft non-life (PSN), and 266 for applied soft non-life (ASN).

Table 1. Distribution of Respondents' Academic Programs in Biglan's Framework

	HARD		SOFT	
	Life	Non-life	Life	Non-life
PURE	Biology	Mathematics Physics Chemistry	Psychology Anthropology Sociology Political Science	Linguistics and Literature Economics Philosophy History
APPLIED	Pharmacy	Civil, Mechanical, Chemical, Electrical, Computer Engineering, Computer Science	Teacher, Physical, Science Education Nursing Human Resource Management	Accounting Business Administration Library Science Law Fine Arts Architecture

3.2 Students' Ranking of Importance of the SPGPUE

In order to determine whether there are significant differences on the students' ranking of the seven principles, factorial multiple analysis of variance was performed. Overall result indicated non-significant associations between the three identified independent variables namely discipline classification, gender and year level. Moreover, no significant association was also observed for interaction effects of the three independent variables with respect to the seven principles. At this point, it would seem that irrespective of disciplinal classification, gender and year level, the respondents consider all of the seven principles as equally important.

Results of test in-between subject effects indicated that a significant correlation exists between discipline classification and cooperative learning, $F(7,1636) = 2.102$, $p = 0.040$; discipline classification and gender to cooperative learning $F(24,1636) = 1.834$, $p = 0.008$; and gender and year-level to faculty contact, $F(4,1636) = 2.546$, $p = 0.038$. Subsequent one-way ANOVA indicated significant difference on the perceived importance of cooperative learning across disciplinal groups, $F(7,1777) = 2.875$, $p =$

0.005. Post hoc analysis using Tukey's HSD revealed that PSN category is significantly lower with most of the other categories such as PHN, AHN, ASL and ASN. This in consonance with the definition of soft-pure disciplines to be adoptive of holistic paradigm that gives prime importance on the breadth of intellectual ideas and creative expressions (Biglan, 1973 & Neumann, 2009) thereby making them relatively individualistic.

Another notable observed correlation exists between the independent variables year-level and dependent variable faculty contact, as well as with year-level and gender to faculty contact. Two-way ANOVA was performed using year-level and gender as independent variables and faculty contact as independent variable. Results indicated a significant difference in the rating of importance of faculty contact when the respondents are grouped according to gender, $F(1,1750) = 9.117$, $p = 0.003$ with female respondents expressing a higher mean rating (4.094) compared to male respondents (3.958). With respect to year level, significant difference also exists $F(4, 1750) = 2.052$, $p = 0.049$. The result above reinforces the previously-offered explanation as regards to seniors or final-year students' perceived importance of cooperative learning.

4.0 Implication to Science Teaching and Conclusion

The current study intended to map out students' perceived importance of the SPGPUE based on their chosen disciplinal specialization as well as their gender and year level. While the overall result of the study suggests that the SPGPUE are deemed equivocally important by the respondents irrespective of the classification of their chosen academic discipline, gender or year level; some subtle differences do exist especially with respect to the principle of cooperative learning and faculty contact. In the context of science teaching, it is therefore essential to acknowledge the importance and relevance of faculty contact and cooperative learning in the design and operationalization of science curricula. Each academic program has its own unique sets of praxis and it is oftentimes in the level of classroom interaction that most subtleties occur and are most noticeable; with the teaching of science as a non-exception to the rule. For future directions, it is highly recommended that a program or discipline-specific exploration of students' ranking of the SPGPUE be carried out to come up with a more specific sets of recommendations that will be useful for a given program of interest - in this case, the pure and applied science may be studied in their own to create a clearer picture of students' perception of SPGPUE specific to the discipline.

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