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Instructor- Learner Ratio and Its Implications on Creative Design Skills Acquisition in Higher Education

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Abstract
The enormity of teacher-learner ratio in our classrooms today is overwhelming. Teachers always face large class sizes and try everything in their professional capabilities to achieve results. This has its own academic implications on students' achievement especially in practical courses. Having examined the instructional situations in five selected classes in three Technical Universities in Ghana, this paper seeks to present findings based on problems associated with large class sizes and how they affect students' skills acquisition and course satisfaction. The study adopted the mixed method which combined the qualitative and quantitative approaches. After collecting enough data from randomly selected 225respondents made of students, lecturers and deans, it was discovered that there are significant differences between large and small class sizes with respect to students' skills acquisition. It was also evident that large class sizes inhibits students' skills acquisition and academic achievement primarily because teachers tend to employ instructional approaches that are convenient to them. While students in small classes exhibited high skills proficiencies which reflected in the grades they obtained and had expressed high level of course satisfaction, students in the large classes demonstrated less skills acquisition and course satisfaction. It was discovered that class size determined frequency of assessment and feedback to students as well as the quality of instructors' attention and interaction with. The study recommended infrastructural development and the need to enhance the human resource capacity in our Technical Universities.
Keywords: *Teacher-learner ratio, Teacher-student interaction, Assessment and feedback, Students' satisfaction level.*

1.0: Introduction

Education in general improves the livelihood of people while tertiary education in particular contributes significantly to the development process of a country. Effective tertiary education means improved economic outcomes. It contributes to growth through labour productivity, effective public services, and providing opportunities for all.

As higher learning institutions, the Technical Universities are mandated under Technical University Law (Act 745) to provide tertiary education in the fields of manufacturing, commerce, science, technology, applied social sciences and applied arts (Nyarko 2011). Again they are to provide opportunities for skills development, applied research and publication of research findings for development.

Being a technical tertiary institution, the technical university education is expected to *give* learners practical experiences on purpose to equip them with industrially and economically viable skills. Students are expected acquire various skills through hand on experience through constructivist approach of learning to equip then with problem solving abilities.

Having received good technical university education, graduates are expected exhibit higher level skills to a rising proportion of the workforce and to demonstrate lifelong learning ability, with emphasis on creativity and flexibility to permit constant adaptation to the changing demands of a knowledge-based economy (Ramud, 2006).

Unfortunately, certain pedagogical situations seem to be indenting the quality of products from our Technical Universities as some employers reported deficiencies not only in the technical skills of job applicants, but also in the "employability skills" such as creativity, problem-solving skills, teamwork and leadership skills that are indispensable to productivity in today's workplace (Frimpong 2015).

Physical infrastructure, learning resources and teacher-student ratio are some noticeable variables that have direct effect on the overall quality of graduates in our Ghanaian institutions particularly in the technical universities. While there have been some studies on teacher-student ratio in Ghana, none of them particularly addresses issues relating to practical skills acquisition in the tertiary institutions.

This study therefore seeks to investigate the impact of class size on students' skills acquisition in Creative Design in the Ghanaian technical universities.

2.0: Review of Related Literature

2.1: Tertiary Education

Tertiary education encompasses all post-secondary schooling which includes colleges of education, Technical Universities and universities. Tertiary education improves the lives of individuals and supports wider economic growth and prosperity. According to the Ministry of Education, New Zealand (2014) skilled and knowledgeable individuals are essential to the success of businesses and other organizations. Access to skilled workers allows businesses to improve the quality of their products and services. In Ghana, the Technical Universities (which are tertiary institutions) are strategically positioned for the training of highly-skilled human resource for economic growth (Frimpong, 2015). The Technical university education, according to Ukpai (2012), seeks to provide technical and vocational education to students by giving them training that impart the necessary skills for the production of technicians, technologists and other skilled personnel who shall be enterprising and self-reliant.
To achieve this, there should be suitable learning environment that whet up learning through quality teacher – student interaction, meaningful learner engagement during lesson and good feedback communication. The effective use of these pedagogical approaches for good learning outcome is greatly dependent on the teacher-student ratio which is generally referred to as the class size.

2.2: Large Class Size

According to Bawakyillenuo et al., (2013) a critical element affecting the quality of training received by students in tertiary institutions in Ghana, and by extension reinforcing the mismatch between tertiary graduates and the needs of firms, is the students-lecturer ratio (SLR). Data on enrolment into tertiary education institutions over the years indicates an increasing demand for tertiary education. Students-lecturer ratio worsened in Ghanaian institutions as government, in 2010, placed a ban on the recruitment of employees in the public sector as part of measures to stabilize the economy and effectively manage the public wage bill.
According to Bawakyillenuo et al., (2013), the National Council for Tertiary Education (NCTE) reported that enrolment into Universities increased from 73,408 to 107,058 between 2005 and 2010 and distance education enrolment increased from 20,772 in 2006 to 37,589 in 2010; while enrolment into technical university also increased from 24, 903 in 2005 to 46,076 in 2010. Data from the NCTE shows that students' population increases each year in Ghanaian tertiary institutions. The constant rise in students' number without corresponding increase in the number of teachers has great effect on student –lecturer ratio (SLR) in the Ghanaian technical universities. These institutions educate future leaders and develop the middle-level technical capacities that underpin economic growth and development (Ekundayo and Ajayi, 2009). It is assumed that the student – lecturer ration has some implications on the quality of skills acquisition in the Technical universities.
A large class has no "exact size." Usually it is measured in terms of the number of students per teacher (student-teacher ratio). In some countries, 25-30 students per teacher is considered large, while in other countries this is seen to be normal or even quite small (UNESCO, 2006). While a class of more than 50 students is usually considered a large class, to those who normally teach 25 or fewer students, a class of 35 can be large and overwhelming. Beginning with the 2010/2011 school year, the maximum number of students in each core subject in Florida (based on constitutional amendment) was expected to be 18 pupils in prekindergarten through grade 3; 22 pupils in grades 4 through 8; and 25 students in grades 9 through 12. In Israel the maximum number of students in a classroom is 40. (Jepsen, 2015). In their study Kingma & Keefe (2006), posited that the best class size varies from 21 to 29 students which encourages students to learn about classmates and develop a sense of community. All of this goes to establish the divergent views of people on what the ideal class size should be. With population, economic and infrastructural situations as major determinants of class size one will agree that maximum student number will differ from one region to the other. In view of this Marg (2003) stated that a large class is any number of students a teacher finds problematic to effectively handle.

UNESCO (2006) estimated that 84% of classrooms have less than 40 students to every teacher in the world. Of those countries that exceed 40:1, most are in sub-Saharan Africa and Asia. Sub-Saharan Africa has the highest median student-teacher ratio with the Congo, Ethiopia and Malawi hovering around 70:1. According to Benbow, et al., (2007), when ratios rise above 40 for every teacher, the quality of teaching and learning, in most contexts, begins to suffer.

It is indicated by literature that large classes have a predominance of whole - class instruction, with very little instructional variability (Blatchford et al., 2005). In this instance, there is little emphasis on providing feedback with guidance to students or on stimulating concept formation.

2.3: Class Interaction and Students Course Satisfaction

2.3.1: Instructor-Student Interaction

Studies indicate that interactions between students and instructors enhance learning process and improve performance on tests, increase student motivation, improve attitudes towards coursework, and increase retention rates (Elluminate, 2009). According to Bain, (2004, p. 117), "All the best teachers talked to their students and the quality of those talks made significant difference in the success of the teaching". For students to be successful with good courses satisfaction there must be increased communication between the student and the instructor. Teacher-learner interactions support the student's learning experience (Lehman & Conceição, 2010), especially in the beginning of the semester (Roach & Lemasters, 2006). Students feel connected to the course and the instructor through interaction (Herbert, 2006; Howard, 2009). They need high levels of interaction with their instructor (Burnett et al., 2007) and this increases their interest level, participation and learning.

2.3.2: Student-Student Interaction

The less frequent the class interaction the more likely students will express dissatisfaction with the course. Communication generally provides meaningful dialogue within the classroom environment (Muirhead, 2000) and increases the students' overall satisfaction with the course (Babb et al., 2010). Students need a connection with other students to complement course instruction, and when it is not present, it can produce difficulties (Bambara et al., 2009; Lehman & Concei.ão, 2010) and reduce student satisfaction with the learning environment (Babb et al., 2010).

2.4: Students' Engagement and Course Satisfaction

Analyzing data from colleges and universities, hu and kuh (2003) found that student engagement in educationally purposeful activities had a strong effect on student-reported gains. In addition, some studies find that college students with low ability scores make
greater gains in engagement and academic success (Bauer & Bennett, 2008; Carini, Kuh, & Klein, 2006; Kuh et al., 2008).

In a National Survey of Student Engagement at a research university Karen, Webber and Qin (2013) found that higher levels of engagement in a variety of curricular and cocurricular activities significantly contribute to cumulative GPA and students' perception of the overall academic experience. Students who were more engaged earned a higher GPA and reported higher satisfaction with their overall academic experience.

Student engagement, according to Tyler-Smith (2006), is critical in every learning environment and the lack of it can lead to withdrawals and dropouts. In an extensive review of the literature surrounding active learning, Prince (2004) discovered substantial empirical support for the assertion that active engagement can significantly improve recall of information and substantially contributes to student satisfaction.

2.5: Class Size and Instructional Objective Achievement

Every teacher has some objectives to achieve at the end each lesson and academic year. This is achievable when learning environments that promote student-centered learning that engage learners in *constructivist* classrooms are created (Dodge et al., 2003). These type of classrooms, according to Sarama and Clements (2001) promote students' problem solving skills. Nye et al., (2004) acknowledge that the reason why small classes led to higher achievement is because they permit teachers to more effectively *individualize* instruction. Small classes may also tend to have fewer disruptions making all-class instruction more effective.

Resnick (2003) posited that smaller classes benefit student achievement, claiming that teachers in small classes pay greater attention to each student. Students in these classes experienced continuing pressure to participate in learning activities and became more involved and better. Attention to learning goes up and disruptive and off-task behavior goes down. Pedder (2006) believed that class size might impact classroom processes and pupils' learning. He stated that smaller class sizes allowed teachers to cover more curriculum and students to be more cognitively engaged in the learning process which, according to him, leads to improved student achievement

Some researchers and scholars argue that class size itself does not determined students' learning outcomes, but rather smaller classes may provide opportunities for other educational interventions. Glass et al., (1982) posited that it was not simply the number of students in a class that impacts learning. According to them, "class size has no magical effect on student achievement". In their view, what goes on in the classroom; what the teacher does; the teacher's manner with the students, and what the students themselves do or are allowed to do in the class determine the learning outcome irrespective of the class size.

The core focus of this study is on how class size affects teaching and learning of Creative Design in the Technical universities.

3.0: Research questions

This study focuses on three major questions as stated below.

1. How does teacher- learner ratio affect class interaction and teachers' attention to students during Creative Design instruction?
2. How does class size affect assessment, feedback and students' skills acquisition in Creative Design?
3. What is the satisfaction level of students in small classes as compared to large classes?

4.0: Research Methodology

The study adopted the mixed method which combined the qualitative and quantitative approaches. The study was conducted in five (5) departments in three (3) state Technical Universities in Ghana. In all, a total of two hundred and twenty-five (225) respondents from the (3) Technical Universities constituted the sample size for the study. This is made up of the following;

- A total of eight (8) Visual Art related lectures in the three Technical universities.
- Seventy (70) students from each Technical university making a total 210 students in the three technical universities.
- Three (3) Deans of school and four (4) Heads of department

Questionnaire, interview and observation were tools employed for data collection. The questionnaires for the students were different from those given to the teachers as the researcher needed different information from the respondents.

Convenience sampling was employed for the selection of the three technical universities. The study was conducted in four departments (two departments were selected in one of the technical universities) and each department consists of three classes. Simple random sampling was adopted to select one class out of three classes in each department.

5.0: Discussion of Results

As earlier established in the literature, there is no exact threshold number accepted worldwide below or above which a class could be considered small or large. Since the maximum number of students in a class varies from country to country and does not exist in some countries as in the case of Ghana, this study has adopted the Israelis maximum number of forty (40) students per class as mentioned by Jepsen, (2015) and was supported by Benbow, et al., (2007) in their study that the quality of teaching and learning, in most contexts, begins to suffer when ratios rise above 40 students for every teacher. This is to say, in this study, a class size below 40 is regarded small and a size above 40 is considered large. Table 1 below indicates the sizes of the five selected classes in three state technical universities in Ghana.

Table 1: Student – Lecturer Ratio

Class	Number of students	Number of lecturer
Class A	39	1
Class B	73	1
Class C	85	1
Class D	106	1
Class E	26	1

As seen in Table 1, class A and E have the optimum student-teacher ratio of number of 39:1 and 26:1 and can be considered, with regard to this research, as small class sizes. The rest of the class is considered large with class D recording 106 students.

Teacher's Attention to Individual Needs of Students

In practical courses such as Creative Design, students generally need some personal assistance from their instructors on say an approach to get a specific task performed. The needed assistance varies from one student to the other which is why giving individual attention is badly needed in skills related courses.

Table 2: Students' Responses on Whether They Received Needed Attention From Lecturers or Not

Class	Total number of students	Yes	No
Class A.	39	35 (89%)	4 (11%)
Class B.	73	33 (45%)	40 (55%)
Class C.	85	27 (47%)	58 (53%)
Class D.	106	42 (40%)	64 (60%)
Class E	26	24 (92%)	2 (8%)

While as low as 40% *of those who needed help* in class **D** (with total student number of 106) received some levels of attention from their instructors, majority (92% and 89%) in classes E and **A** respectively received *adequate* attention from their instructors probably due to the small size of the class. It was established in an interview with some teachers of large classes that they did not have the time to attend to all the students *who needed help*. This confirms the assertion made by OECD, (2012) that class size affects how much time and attention a teacher can give to individual students, as well as the social dynamics between students.

Data collected revealed that 31% of students, in the *three large classes* put together, needed o*ne-on one instruction* but they usually did not have that opportunity due to the class size. Teachers, on the other hand, reported that there was little they could do as many students called for attention at the same time. As a teacher attends to an individual the rest would have to endure a long wait before they were attended to and most of the time students were greatly disappointed as a great number of them never received any attention before time period was over. It was discovered in an interview that students sometimes misinterpret teachers' inability to give needed attention as rejection or teachers' dislike for them. The absence of effective supervision and attention from the teacher has direct implications on students' skill acquisition in Creative Design as they develop wrong perceptions and attitudes which consequently affect their learning outcomes. Through classroom observation and documented evidence of scores, it was found out that students in smaller classes are more skillful in designing, colour application and finishing Creative Design works than those in the large classes. Students' achievement is, to some extent, based on their perception of their teachers. It is argued by Eschenmann (1991) that students whose teachers are interested in their development and growth have high performance levels. Again, Cross (2001) stated that persistent lack of teachers' attention to individual needs of students is a great disincentive to effective learning. This stands to reason that there could be significant level of improvement in students' skills acquisition if enough attention is given to individual needs.
Students in small class sizes received more individual attention than those in the large classes. Teachers closely work with students to improve on their skill deficiencies. As a result of this a great number of students in class A demonstrated high level of skills in their Creative Design works.

Teacher- Student Interactions during Creative Designing Instruction
Congruent to teacher's attention to students is teacher-student interaction. It was discovered that about 82% of students in the small classes had one form of interaction or the other with teachers during instruction as against 39% in large classes. Some form of interactions observed in classes as teachers moved from one table to other include teacher advising individual students to position a pencil at 30^{o}C while shading; to turn drawing book in portrait position; to avoid using ruler while sketching; consider layout when drawing; interaction on appropriate techniques of texturing a design and a guide to achieve good proportion and good motif development. It was observed that in the small classes where there was enough teacher-student interaction where suggestions were made by teachers to students; strengths and weaknesses were communicated; students' questions were answered and scaffoldings techniques were employed during interaction, there was positive impact on learning outcome. Communication between the student and the professor is a powerful predictor of student satisfaction (Babb et al., 2010),

It was observed that in the atmosphere of good interaction, finished works looked creative, neat and of good proportion. However students in the large class settings (where there was limited teacher-student interaction) tend to depend on other students they felt were relatively better than them for assistance.

Assessment and Feedback on Students' Performance
Course lecturers, according to the study, contacted their students once every week for Creative Design. Because it is a practical course students are expected to carry out practical works during every instructional section which

has to be assessed after instructional period. In Table 3, students are assessed on weekly basis in class A, B and E while the rest are assessed once every two weeks. The variation in the frequency is largely due the difference in class sizes. While teachers of small class sizes are comfortable assessing their students during each instructional period, teachers of large classes reported that it would be too stressful to do so.

Table 3: Frequency of Assessment

Class	Frequency of assessment
Class A.	Four times a month (once in every teaching section)
Class B.	Four times a month (once in every teaching section)
Class C.	twice a month (once in two teaching sections)
Class D.	Twice a month (once in two teaching sections)
Class E	Four times a month (once in every teaching section)

According to Nanoo (2007) frequent assessment and early feedback encourage students to study and practise consistently skills that were taught, thus increasing the likelihood of good learning outcomes. In addition, frequent assessment and feedback make them proactive to improve on their performances. As maintained by Ekunle (2001) regular assessment and feedback is an axiomatic principle of effective learning. Assessment, as stated by Baume and Baume (2006), supports and guide learning and evaluate the effectiveness of teaching. Studies revealed that students always need feedback confirmation to know if they are on the right track (MacDonald & Thompson, 2005; Roach & Lemasters, 2006; Roberson & Klotz, 2002; Stodel et al. 2006). Feedback informs students on their strengths and weaknesses which influence them to strategize their learning approaches in order to improve upon their performances.

An average of fifty seven percent (57%) of students in large classes reported that they were not pleased with feedback communication. In many cases the only feedback the students received was marks (grades). Some teachers observed that commenting on students' weakness and areas that need improvement during assessment when dealing with large classes is time consuming. They preferred to award marks and generally address issues of strength and weakness during lesson. Appropriate feedback is necessary for a student to benefit from a course (Chickering & Gamson, 1987; Muirhead, 2000). Feedback and other communication should be empathetic and compassionate but also provide advice and support, focus on clear objectives, and encourage completion of tasks (Funk, 2005). Constructive feedback helps the student progress throughout the course (Roach & Lemasters, 2006; Roberson & Klotz, 2002). Students always need more feedback, more resources and increased attention (Shelton & Saltsman, 2004).

Lecturers of small classes expressed confidence and satisfaction regarding the skills levels of their students in Creative Design simply because students were regularly assessed; feedbacks were given and *design appreciation* which communicates the strengths and weakness of students was regularly conducted all which are great motivation for students' success.

Students' Task Completion in Classroom

During the research, data was collected to ascertain students' participation and task completion in Creative Design. It was revealed that majority of students in classes A (91%) and E (89%) usually completed tasks assigned to them during instructional periods while the completion rate ranges from 62 to 82% in the smaller classes.

Table 4: Completion of Task in the Classroom

Class	Number of students	Completed task	Did not complete task
Class A	39	91%	9%
Class B	73	82%	18%
Class C	85	62%	38%
Class D	106	67%	43%
Class E	26	89%	11%

This is so because students in the small classes received enough attention from their teachers and knew what was required of them and how to get it done. Adequate attention and supervision, according to Cross (2001), motivate students to work hard and complete task in time. Teacher's attention provides clear sense of direction, control and purpose which spur interest in students. He added that students who feel they have more power or control over their academic performance tend to be more highly motivated and are generally more successful. On the other hand, it was discovered from data collected that a great fraction of the students in class D (43%) and 38% in class C could not complete their works. According to Cross (2001) if an individual doubts his abilities to be successful at a task, he lacks motivation for that specific task. This, perhaps ,is the underlying factor of the details in Table 4.

Relationship between Class Size and Students' Performance

Table 5: Students' Grade Analysis in Classes

	CLASS A		CLASS B		CLASS C		CLASS D		CLASS E	
Grade	number of students	Percen-tage	number of students	Percen-tage	number of students	Percen tage	number of students	Percen-tage	number of students	Percen-tage
A	9	23%	7	10%	6	7%	11	11%	5	19%
B	16	41%	22	30%	17	20%	19	18%	8	31%
C	9	23%	27	37%	30	35%	30	28%	9	35%%
D	5	13%	13	18%	28	33%	34	32%	4	15%
F	0	0%	4	5%	4	5%	12	11%	0	0%
Total	**39**	**100%**	**73**	**100%**	**85**	**100%**	**106**	**100%**	**26**	**100%**

It could be seen from Table 5 that the small classes (classes A and E) demonstrate good academic outputs by recording 23% and 19% (respectively) of students having grade A as against 6% to 11% with grade A in the large classes. Again, while none of the students in class A and E (small classes) had grade F, 5% and 11% of students in the large classes had F. This stands to reason that there is significant difference in the performance between small and large class sizes with respect to students' skills acquisition.

Students' Level of Course Satisfaction

Students' satisfaction surveys are important in ascertaining whether educational institutions are fulfilling their mission. It is well known that the most important product of educational institutions is qualified graduates. According to Data, America and Wei-Choun (2012) in order to best prepare students so that they are sought after by employers upon graduation, an effective learning environment that promotes positive perception and course satisfaction among students is needed. Table 6 focuses on interaction and attention; assessment and feedback; skills acquired and overall satisfaction and confidence in completing.

Table 6: Students' Course Satisfaction

variables	Large classes		Small classes	
	Satisfied	Dissatisfied	Satisfied	Dissatisfied
interaction and attention	38%	62%	84%	16%
assessment and feedback	43%	57%	72%	28%
skills acquired	61%	39%	84%	16%
Overall satisfaction and confidence in completing with desired grades	55%	45%	82%	18%

Interaction and Attention

Responses to questionnaire indicated that only (38%) of students in large classes expressed satisfaction in class interaction and teachers' attention to individual needs during Creative Design instruction. A majority of 62% of them were dissatisfied with regards to the quality class interaction and teachers' attention. This agrees with studies which stated that decreased student- teacher interaction leads to lowered interest and satisfaction among students with increased feelings of isolation, disillusionment, and with greater risk of dropping out of the

learning environment (Liu, Magjuka, Bonk, & Lee, 2007; Morris, Finnegan, & Wu, 2005). The results in Table 6 could probably be the reflection of the quality of the level of class interaction and attention received by students.

Assessment and Feedback

Majority of respondents in the large classes (57%) expressed dissatisfaction on assessment and feedback. The students felt they were not frequently assessed and feedbacks on assessments were not quite helpful as they were mere marks and did not provide direction on how to improve on performance. According to Baume and Baume (2006) providing effective, easily understood and timely feedback should be institutional priority to improve student satisfaction and to maximize achievement.

Haven asked the class A and E students to state two important factors leading to their achievement among the following factors (students' academic goal; teacher's attention to individual needs; frequent assessment; teacher - student interaction and feedback), 72% of total respondents believed that frequent assessment and feedback were top factors. This is probably why Baume and Baume (2006) recommended after their study that assessing and providing effective, easily understood and timely feedback should be institutional priority to improve student satisfaction and to maximize achievement. "Timely, authentic feedback is a powerful tool for both assessment and personal growth" (Koole et al., 2010, p. 61). Feedback is critical to student success (Herbert, 2006; Lehman &Concei.ão, 2010).

In an interview response, the class A teacher said haven ever taught a much larger class in his profession as a teacher before, he considered his current class to be relatively small and had adopted one on one instruction with the weaker students while the rest were given adequate attention and this, according to him, has produced positive results. This agrees with the assertion of past studies that *reduced class size* is related to individualization of teaching and higher academic output (Blatchford, 2003b and Blatchford et al., 2005).

Skills Acquired

While an average of 61% expressed satisfaction in skills acquired in the large classes, 84% were satisfied in the small class. Thirty nine percent (39%) of students expressed dissatisfaction because they desired to have more practical exposure than they had experienced. The greater the student's engagement in practical experiences in Creative Design, the greater his or her level of skills acquisition and general course satisfaction. Responses from teachers on students' engagement in the large classes revealed that they preferred to give fewer assignments to reduce the stress of marking.

According to a greater number of students, they felt there was more to learn than they acquired.

Overall satisfaction and confidence in completing with desired grades

Eighty-three percent (83%) of students in class A and eighty (80%) in class E (small sized classes) expressed great satisfaction with the overall academic experience. They also expressed confidence in skills acquired in Creative Design and their ability to execute work accurately. They reported that they had full attention of their teachers who guided them in skills development.

Conclusions

Class size had direct effect on the level of teacher –student interaction. While there was adequate class interaction in the small classes, there was very limited teacher - student interaction in the large classes. This limited teacher- student interaction affects students' perception which consequently reflected on their skills and knowledge acquisition in Creative Design

Students in small class sizes received individual attention regarding skills development, frequent assessment and feedbacks. They exhibited high skills proficiencies which were reflected in the grades they obtained. On the other hand, restricted opportunity for individual attention; infrequent assessments and inadequate feedbacks in large classes have negatively affected students' perception and attitudes towards learning which consequently affected their skills acquisition and general learning outcomes.

There was less students' engagement in practical activities in large classes while students in small classes were actively engaged in learning activities with higher task completion rates leading to high skills acquisition.

Recommendations

1. Limited infrastructural development accounts for the large class sizes in the Technical Universities. Improving infrastructure will drastically reduce classes to manageable sizes which will enhance pedagogy. The government of Ghana, ministry of education and other stakeholders should prioritize infrastructural development in the tertiary institutions especially the Technical Universities to commensurate with the ever increasing student number.

2. Technically, improve improved infrastructure implies increase in the number of classes which will require more instructors. In this respect, the human resource capacity in the Technical Universities should be enhanced by the government so that there will be more hands for improved instruction.

3. In spite of the large class situations, instructors should endeavour to employ effective instructional strategies such as good lecturer - student interaction; frequent assessment and prompt feedback for optimal students' output. Instructors should offer timely feedback to increase students' course satisfaction in Creative Design. Feedback should be offered on progress instead of simply assigning a mark.

4. This research was limited only to the Technical Universities. Including other institutions of higher learning such as Colleges of Education, universities (other than Technical Universities) and Polytechnics might broaden the scope, increase respondents and provide more information which may offer conclusions that are more representative of the overall teacher-student ratio phenomena and their implications on pedagogy in higher education in Ghana. Further study should therefore broaden the scope for better representation.

5. Future researchers could conduct a quantitative study by employing statistical tools such as t-test and ANOVA for more analysis and comparisons of learning outcomes and course satisfaction between small and large classes.

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