

Teaching or Service? A Proposed Model Developed for Student Evaluation of Teaching Quality from the Perspective of “Teaching as a Service”*

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Abstract: Student evaluation of teaching (SET) is one of the most commonly used instruments to measure teaching quality. Its use in higher education is important because it benefits multiple parties. It benefits students because they can voice out their comments on the teaching they receive. It benefits teachers because they can adjust their teaching according to student feedback. Universities also benefit because they can understand the overall teaching performance of their academics. Despite the respondents of the questionnaires for teaching quality evaluation are students, most of these evaluation tools may not be able to reflect students’ perceptions toward the teaching they have received because these tools are usually developed from the universities’ perspective for the purposes of promotions or salary raises. To better reflecting the perceived teaching quality students have experienced, we developed a set of teaching quality evaluation tool adopted from the popular PZB (Parasuraman, Zeithaml, and Berry) service quality (SERVQUAL) measurement instrument. Our research model and measurement instrument are tested using surveys with two samples of 358 and 220 recruited from undergraduates in one of the universities in Macau in 2017 and 2023, respectively. The results revealed that, among the five SERVQUAL dimensions, Empathy and Reliability dimensions significantly affected students’ satisfaction towards their teachers, while the Responsiveness dimension did not have such an impact. The Tangible dimension had no impact on satisfaction toward teachers but directly influenced the overall course satisfaction. Satisfaction toward teachers had a significant impact on students’ perceived overall course satisfaction. The impact of Assurance on teaching quality differed between the two cohorts. For researchers, this study demonstrates the suitability of adopting SERVQUAL, a commercial service quality

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evaluation tool with items revised to fit education context, can effectively measure students' satisfaction on their learning. For educators, our study sheds light on the directions for teachers to allocate their efforts to help students increase learning effectiveness through their satisfaction on their learning process.

Keywords: Teaching evaluation; SERVQUAL; Teaching as a service; Satisfaction; Students as customers

教學還是服務？

從「教學即服務」視野下建立的教學品質評估模型

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摘要：教學品質評估在高等教育的發展中有著重要的角色，這不僅僅是在於學生或教師，以至於整個學校。對學生而言，學生可以通過教學品質評估表達他們的意見，反映整個教學品質；對教師而言，教師可以通過教學品質評估來調整教學方向或深淺程度。對整個學校來說，教學品質評估可以反映出教師在教學中的整體表現。在教學品質評估中，雖然調查對象為學生，但大多數的問卷無法反映出學生對教學品質的真實情況。原因是因為這些教學品質評估大多是從學校的角度出發，目的是為了教師晉升或薪金調整。SERVQUAL 量表是由美國教授 A.Parasuraman, Valarie A. Zeithaml and Leonard L. Berry（簡稱 PZB）三人於 1985 年所提出的「服務品質概念模式」（PZB 模式），为了更好的反映教學品質，本研究採用 SERVQUAL 量表來進行調查。本研究透過問卷形式進行，分別於 2017 年和 2023 年從澳門某所大學中招募了 358 名和 220 名本科生進行研究。研究結果顯示，在 SERVQUAL 的五個維度中，同理心和可靠性對學生的滿意度有顯著的影響，回應性維度則沒有影響，有形性對學生的滿意度沒有影響，但對整體教學品質評估有影響。滿意度對整體教學品質評估有重大的影響。保證性對教學品質評估的影響在兩個群體中有所不同。本研究對 SERVQUAL 進行了修改及調整，使其更適用於教育方面，可以有效地測量學生對學習的滿意度；對老師來說，本研究可以更有效的了解學生需要，從學習過程中提升學習效率以增強學生的滿意度。

關鍵詞：教學評估、SERVQUAL、教學即服務、滿意度、學生即顧客

1. Introduction

Student evaluation of teaching (SET) in higher education is one of the key instruments adopted by most higher educational institutions to evaluate their faculties' teaching performance. It is considered important in improving teaching quality because it is an essential source of getting responses from students.¹ With these responses, individual teachers could further evaluate the appropriateness of their teaching strategies and practices to fit the pedagogical needs among the teaching and being-taught sides.²

Optimizing learning effectiveness is one of the primary goals of education systems, students, teachers and teaching contents are the fundamental constitutions of the systems.³ Both the learning and teaching sides would have their own expectations on achieving the desired effectiveness of the learning/teaching processes. However, it is not rare to observe that students' goals and their behavior being inconsistent. Such inconsistency may be caused by students' early expectations and the subsequent effort they have to pay for studying, or the discrepancies between the learning and teaching strategies and practices. Therefore, understanding students' expectations of the learning and teaching processes is a must to narrow down the discrepancies.⁴

Teachers are shouldering the responsibilities to help equip students for their future through the delivery of knowledge and experiences to the next generations. The process of

¹ Berk, R. A., "Survey of 12 Strategies to Measure Teaching Effectiveness," *International Journal of Teaching and Learning in Higher Education* 17.1(2005): 48-62; McKeachie, W. J., "Student Ratings: The Validity of Use," *American Psychologist* 52.11(1997): 1218-1225.

² Pan, G., Shankaraman, V., Koh, K. & Gan, S., "Students' Evaluation of Teaching in the Project-based Learning Programme: An Instrument and a Development Process," *The International Journal of Management Education* 19.2(2021): 100501; Spooren, P., Brockx, B. & Mortelmans, D., "On the Validity of Student Evaluation of Teaching: the State of the Art," *Review of Educational Research* 83.4(2013): 598-642.

³ McLaughlin, M. W., & Talbert, J. E., "Contexts that Matter for Teaching and Learning: Strategic Opportunities for Meeting the Nation's Educational Goals," (1993).

⁴ Appleton-Knapp, S. L. & Krentler, K. A., "Measuring Student Expectations and their Effects on Satisfaction: The Importance of Managing Student Expectations," *Journal of Marketing Education* 28.3(2006): 254-264.

transferring knowledge to the next generations can be considered as a process of delivering *pedagogical services* to meet students' needs and expectations.⁵ In the context of education, the needs are students' knowledge pursuance.⁶ To optimize the learning and teaching effectiveness, it is thus worthwhile to understand how students perceive the level of teaching quality they have experienced during their learning process.

Content is another important element in the triangle of the core of education systems.⁷ Curriculums, forming a major component of the content, are usually designed in a way to develop students' domain knowledge and at the same time fulfil the needs of industries and societies.⁸ Despite the emphasis of the domain knowledge requirements, students' expectations and needs should not be neglected when designing these curriculums and the related assessments, simply because students are those who are trained within these frameworks.⁹

Even though teaching services should not be considered as commercial services, the feedback of this education *service* from students is important. Through the feedback, teachers can understand more about the perceived appropriateness or inappropriateness of

⁵ Lupo, T., "A Fuzzy ServQual based Method for Reliable Measurements of Education Quality in Italian Higher Education Area," *Expert Systems with Applications* 40.17(2013): 7096-7110; Tan, K. C., & Kek, S. W., "Service Quality in Higher Education Using an Enhanced SERVQUAL Approach," *Quality in Higher Education* 10.1(2004): 17-24.

⁶ Douglas, J., Douglas, A. & Barnes, B., "Measuring Student Satisfaction at a UK University," *Quality Assurance in Education* 14.3(2006): 251-267; Eagle, L. & Brennanm, R., "Are Students Customers? TQM and Marketing Perspectives," *Quality Assurance in Education* 15.1(2007): 44-60; Feldman, R. S. & Prohaska, T., The Student as Pygmalion: Effect of Student Expectation on the Teacher," *Journal of Educational Psychology* 71.4(1979): 485-493.

⁷ McLaughlin, et al., "Contexts that Matter for Teaching and Learning," (1993).

⁸ Akhmetshin, E. M., Mueller, J. E., Yumashev, A. V., Kozachek, A. V., Prikhodko, A. N. & Safonova, E. E., "Acquisition of Entrepreneurial Skills and Competences: Curriculum Development and Evaluation for Higher Education," *Journal of Entrepreneurship Education* 22.1(2019): 1-12.

⁹ Akhmetshin, et al., "Acquisition of Entrepreneurial Skills and Competences: Curriculum Development and Evaluation for Higher Education," *Journal of Entrepreneurship Education* 22.1(2019): 1-12; Vasefian, F., Arabhashemi, M. & Fatehi, H., "A. Explaining a Model of Applying Critical Thinking Components in High School Curriculum Development: A Qualitative Approach," *Iranian Evolutionary and Educational Psychology Journal* 4.4(2022): 223-231; Xie, Q. & Chen, J., "The English Communication and Learning Needs of Master of Business Administration Students and Curriculum Development at a Chinese University," *SAGE Open* 9.1(2019): 2158244019835951.

their teaching from students' perspective. Tuning of the pedagogical strategies and practices can then be applied.¹⁰ When a match between students' expectations and their perceived teaching service quality is there, it helps raise students' motivations to learn, cultivate better talents, increase overall academic performance,¹¹ and ultimately, contribute to societies. Hence, with the understanding of students' satisfaction toward the teaching service they have received through evaluation feedback, the following benefits can be realized.

First, it is important to determine whether students are satisfied with the teaching they have received. A satisfied student or alumni would disseminate positive statements by word of mouth (WoM) about their Alma Mater to acquaintances (which is equally important as positive WoM in the business world).¹² Consequently, universities would attract more applications from potential students.

Second, teachers can use the feedback to make appropriate adjustments to their teaching strategies and practices to ensure a better fit between the teaching and learning sides. If the fit can be optimized, students would feel more comfortable, have higher confidence in studying and, be more willing to attend classes. It would ultimately improve students' learning outcomes.¹³ Furthermore, teaching and learning are influencing each other.¹⁴ When the fits are optimized, the performance of both sides will be improved.

Finally, higher education will be benefited as well. Universities can become more prestigious when their students are performing well in their career, which not only attracts more high-quality students and faculties, but also encourages more grants and collaboration

¹⁰ Golding, C. & Adam, L., "Evaluate to Improve Useful Approaches to Student Evaluation," *Assessment & Evaluation in Higher Education* 41.1(2014): 1-14, doi: 10.1080/02602938.2014.976810.

¹¹ Saeed, S. & Zyngier, D., "How Motivation Influences Student Engagement: A Qualitative Case Study," *Journal of Education and Learning* 1.2(2012): 252-267.

¹² Rasheed, R. & Rasid, A., "Role of Service Quality Factors in Word of Mouth through Student Satisfaction," *Kybernetes* (2023): 2023.

¹³ Ko, W.H. & Chung, F.M., "Teaching Quality, Learning Satisfaction, and Academic Performance Among Hospitality Students in Taiwan," *World Journal of Education* 4.5(2014): 11-133.

¹⁴ Polya, G., "On Learning, Teaching and Learning Teaching," *The American Mathematical Monthly* 70.6(1963): 605-619; Sherin, M.G., "When Teaching Becomes Learning," *Cognition and Instruction* 20.2(2002): 119-150.

from industries.

Despite the aforementioned benefits, debates about teaching as a service, and especially students as customers, remain among academics.¹⁵ Not to consider students as commercial customers, but as the recipients of teaching services, we adopted the SERVQUAL five service quality dimensions as the basis and developed our SERVQUAL-like teaching evaluation instrument and research model.¹⁶ We aimed to provide answers to the following research questions:

1. Among the five SERVQUAL service quality dimensions, which dimension(s) would be more influential on students' satisfaction with teaching quality?
2. What roles do teachers play in influencing overall course satisfaction?

2. Research Background and Theoretical Foundations

2.1 Teaching as a Service

Education aims to foster the talents of future generations, such as equipping students with reflective/critical thinking and experiential learning skills.¹⁷ Through the knowledge transfer processes, teachers are indeed providing professional education services to students, aiming to equip them for the future. Teachers are providing one of the greatest

¹⁵ Conway, T., Mackay, S. & Yorke, D., "Strategic Planning in Higher Education: Who are the Customers," *International Journal of Educational Management* 8.6(1994): 29-36; Cuthbert, R., "Students as Customers," *Higher Education Review* 42.3(2010): 3-25; Guilbault, M., "Students as Customer in Higher Education: Reframing the Debate," *Journal of Marketing for Higher Education* 26.2(2016): 132-142; Guilbault, M., "Students as Customers in Higher Education: The (Controversial) Debate Needs to End," *Journal of Retailing and Consumer Services* 40(2018): 295-298; Olshavsky, R. & Spreng, R. A., "Consumer Satisfaction and Students: Some Pitfalls of Being Customer Driven. Journal of Consumer Satisfaction," *Dissatisfaction and Complaining Behavior* 8.2(1995): 69-77.

¹⁶ Parasuraman, A., Zeithaml, V.A. & Berry, L.L., "SERQUAL: A Multiple-item Scale for Measuring Consumer Perceptions of Service Quality," *Journal of Retailing* 64.1(1988): 12-40.

¹⁷ Baron, J., "Reflective Thinking as a Goal of Education," *Intelligence* 5(1981): 291-309; Dewey, J., *Experience and Education*, New York: Simon & Schuster, 1997, (1938); Kolb, A.Y. & Kolb, D.A., "Learning Styles and Learning Spaces: Enhancing Experiential Learning in Higher Education," *Academy of Management Learning & Education* 4.2(2005): 193-212; Vasefian et al., "A. Explaining a Model of Applying Critical Thinking Components in High School Curriculum Development: A Qualitative Approach," *Iranian Evolutionary and Educational Psychology Journal* 4.4(2022): 223-231.

and honorable services to societies, simply because the education services provided by teachers have dramatic impact on future generations. Education teaching services are different from commercial services in terms of the nature of the “services”. There is no commercial exchange between the teaching side and the learning side in a university, instead the exchanges of teaching services happen when teachers spend their time and effort in delivering the teaching materials while the students spend their time and effort in learning.¹⁸ The concept of “student as customers” is opposed by some academic because different from the commercial world,¹⁹ students have to exert significant efforts, working together with their teachers, to achieve the desired learning outcomes through the learning and teaching processes.²⁰ In fact, students are “a real learner is a producer, not a consumer, of the knowledge he or she gains”(21. p.32).²¹ However, students, as the recipients of teaching services, it is essential and valuable for teachers to know students’ perception of the services they have received as “the opinion of those who eat the dinner should be considered if we want to know how it tastes”.²²

2.2 Teaching Quality Evaluation

Student evaluation of teaching (SET) is an assessment of teachers’ teaching quality.²³ It is generally believed to be one of the most effective metrics to measure teaching

¹⁸ Obermiller, C., Fleenor, P., & Peter, R., “Students as Customers or Products: Perceptions and Preferences of Faculty and Students,” *Marketing Education Review* 15.2(2005): 27-36.

¹⁹ Clayton, D. E., & Haley, D. A., “Marketing Models in Education: Students as Customers, Products, or Partners,” *Marketing Education Review* 15.1(2005): 1-10.

²⁰ Albanese, M., “Students are not Customers: A Better Model for Medical Education,” *Academic Medicine* 74.11(1999): 1172-1186; Bunce, L., Baird, A. & Jones, S.E., “The Student-as-consumer Approach in Higher Education and its Effects on Academic Performance,” *Studies in Higher Education* (2017): 1-21.

²¹ Groccia, J. E., “The Student as Customer Versus the Student as Learner,” *About Campus* 2.2(1997): 31-32.

²² Seldin, P., “The Use and Abuse of Student Ratings of Professors. The Chronicle of Higher Education,” 39.46(1993): A40; et al., “On the Validity of Student Evaluation of Teaching: The State of the Art,” *Review of Educational Research*, 83.4(2013): 598-642.

²³ Chen, Y. & Hoshower, L.B., “Student Evaluation of Teaching Effectiveness: An Assessment of Student Perception and Motivation,” *Assessment & Evaluation in Higher Education* 28.1(2003): 71-88.

performance.²⁴ With SETs, students have the opportunities to voice out their appreciation or depreciation on the teaching they have received and provide feedback to their teachers.²⁵ Despite some teachers maybe suspecting that students may not know exactly *what* they should be taught, students are able to provide feedback of *how* they are taught as they are the ones who have experienced the teaching process. Thus, it is not arguable that, with student feedback, no matter it is negative or positive, teachers can tune their teaching pedagogical strategies and practices accordingly.²⁶ Even though evaluation scores can be considered "objective", there is a concern of using student evaluation as a key component of the reward/punishment system.²⁷ It is not rare that a few students would use the evaluation as a weapon to negotiate with their teachers for benefits, such as fewer assignments, easier tests and higher grades. It happens because those students know that their evaluation may have a great impact on their teachers' performance evaluation. This dark side of SET becomes more pervasive with the emergence of the "students as customers" phenomenon.²⁸

Despite the criticism of SET, student ratings is still considered as being one of the

²⁴ Huybers, T., "Student Evaluation of Teaching: The Use of Best-worst Scaling," *Assessment & Evaluation in Higher Education* 39.4(2014): 496-513; Spooren, et al., "On the Validity of Student Evaluation of Teaching: The State of the Art," *Review of Educational Research* 83.4(2013): 598-642.

²⁵ Berk, R. A., "Survey of 12 Strategies to Measure Teaching Effectiveness," 48-62.

²⁶ Berk, R. A., "Survey of 12 Strategies to Measure Teaching Effectiveness," 48-62; Golding, C. & Adam, L., "Evaluate to Improve Useful Approaches to Student Evaluation," 1-14.

²⁷ Borch, I., Sandvoll, R. & Risor, T., "Discrepancies in Purposes of Student Course Evaluation: What Does it Mean to be 'Satisfied'?" *Educational Assessment, Evaluation and Accountability* 32.1(2020): 83-102; Emery, C.R., Kramer, T.R. & Tian, R.G., "Return to Academic Standards: A Critique of Student Evaluations of Teaching Effectiveness," *Quality Assurance in Education* 11.1(2003): 37-46; Tran, T.T.T. & Do, T.X., "Student Evaluation of Teaching: Do Teacher Age, Seniority, Gender, and Qualification Matter?" *Educational Studies* 48.4(2022): 443-470.

²⁸ Spooren et al., "On the Validity of Student Evaluation of Teaching: The State of the Art," *Review of Educational Research* 83.4(2013): 598-642; Gregory, J. L., "Applying SERVQUAL: Using Service Quality Perceptions to Improve Student Satisfaction and Program Image," *Journal of Applied Research in Higher Education* 11.4(2019): 788-799; Pham, L., Limbu, Y. B., Bui, T. K., Nguyen, H. T. & Pham, H. T., "Does E-learning Service Quality Influence E-learning Student Satisfaction and Loyalty? Evidence from Vietnam," *International Journal of Educational Technology in Higher Education* 16.1(2019): 1-26; Woodall, T., Hiller A. & Resnick, S., "Making Sense of Higher Education: Students as Consumers and the Value of the University Experience," *Studies in Higher Education* (2014): 48-67.

most essential tools to measure teaching effectiveness as the validity of student ratings have been validated in prior studies.²⁹ A good teaching evaluation should “promote student growth and learning while also inspiring great teachers to remain in the classroom” (30. p. 2).³⁰ A proper teaching evaluation system should aim to help both the students and teachers to grow pedagogically and practically. The pedagogical component of a teaching evaluation instrument helps measure the quality of the subject knowledge, while the practical component evaluates the process of how the teaching materials are delivered. Among all items in the teaching evaluation questionnaire, the single item “overall satisfaction” is the primary focus of most teachers. This overall score (sometimes referred to as single-most-important questions (SMIQs)) is important because this single item is usually incorporated as part of teachers’ performance assessment which may ultimately influence their contract renewal and pay raise.³¹ Despite this SMIQ, teachers should also know how their students feel toward their teachings from different angles.

2.3 SERVQUAL

In commercial sectors, it is critical to justify resources allocation with the benefits generated from investment. If customers do not perceive the products or services as valuable to them, those investments will all be in vain.³² Measurement tools are therefore

²⁹ Abrami, P. C., d’Apollonia, S., & Cohen, P. A., “Validity of Student Ratings of Instruction: What We Know and What We Do Not,” *Journal of Educational Psychology* 82.2(1990): 219; Costin, F., Greenough, W. T., & Menges, R. J., Student Ratings of College Teaching: Reliability, Validity, and Usefulness,” *Review of Educational Research* 41.5(1971): 511-535; Daumiller, M., Janke, S., Hein, J., Rinas, R., Dickhäuser, O., & Dresel, M., “Teaching Quality in Higher Education: Agreement Between Teacher Self-reports and Student Evaluations,” *European Journal of Psychological Assessment* 39.3(2023): 176; McKeachie, W. J., “Student Ratings: The Validity of Use,” 1218-1225; Roxå, T., Ahmad, A., Barrington, J., Van Maaren, J., & Cassidy, R., “Reconceptualizing Student Ratings of Teaching to Support Quality Discourse on Student Learning: A Systems Perspective,” *Higher Education* (2021): 1-21.

³⁰ National Education Association (2010). “Teacher Assessment and Evaluation.” Accessed on Jan January 24, 2024. Accessible at <https://files.eric.ed.gov/fulltext/ED583104.pdf>.

³¹ Sproule, R., “Student Evaluation of Teaching: Methodological Critique,” *Education Policy Analysis Archives* 8.50(2000); Chen, Y. & Hoshower, L.B., “Student Evaluation of Teaching Effectiveness: An Assessment of Student Perception and Motivation,” 71-88.

³² Parasuraman, A., Zeithaml, V.A. & Berry, L.L., “SERQUAL: A Multiple-item Scale for Measuring Consumer Perceptions of Service Quality,” 12-40.

essential to measure customers' perceptions of the service/product quality provided by organizations.³³ In 1988, Parasuraman, Zeithaml, and Berry introduced a quality measurement tool, *SERVQUAL*, which has become one of the most widely used service quality measurement tools in the business world.³⁴ The *SERVQUAL* instrument is used to measure the gaps between customer's expectation of the services and the actual perceived satisfaction level. Through the gaps, organizations can know how satisfied their customers are toward those services. The *SERVQUAL* 1988 version constituted 10 dimensions.³⁵ After several rounds of refinement, five service quality dimensions are retained as the current version. These five dimensions are *Assurance*, *Empathy*, *Reliability*, *Responsiveness*, and *Tangible*. The definitions of these five dimensions quoted in Parasuraman, Zeithaml, and Berry's 1988 article (36. p.23) are:³⁶

1. Assurance -"Knowledge and courtesy of employees and their ability to inspire trust and confidence";
2. Empathy -"Caring, individualized attention the firm provides to its customers";
3. Reliability -"Ability to perform the promised service dependably and accurately";
4. Responsive-ness -"Willingness to help customers and provide prompt service" and
5. Tangible -"Physical facilities, equipment, and appearance of personnel".

SERVQUAL-liked assessment tools are also used in other sectors, for example, *LibQUAL+* (Use Affect of Service, Information Control, and Library as Place as the three service quality dimensions) is currently adopted by over 1300 libraries to evaluate their service performance.³⁷

³³ Fornell, C. A. & Larcker, D. F., "Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics," *Journal of Marketing Research* 18.3(1981): 382-388.

³⁴ Parasuraman, A., Zeithaml, V.A. & Berry, L.L., "SERQUAL: A Multiple-item Scale for Measuring Consumer Perceptions of Service Quality," 12-40; Parasuraman, A., Berry, L. L. & Zeithaml, V. A., "Understanding Customer Expectations of Service," *MIT Sloan Management Review* 32.3(1991): 39-44.

³⁵ Parasuraman, A., Zeithaml, V.A. & Berry, L.L., "SERQUAL: A Multiple-item Scale for Measuring Consumer Perceptions of Service Quality," 12-40.

³⁶ Parasuraman, A., Zeithaml, V.A. & Berry, L.L., "SERQUAL: A Multiple-item Scale for Measuring Consumer Perceptions of Service Quality," 12-40.

³⁷ Thompson, B. (nd). "History of *LibQUAL+*®." Accessed on Jan 28, 2025. Accessible at https://www.libqual.org/about/history_lq.

To understand students' perceptions toward teaching, it is reasonable to measure their satisfaction on the teaching quality. Students' emotion has positive impact on their learning,³⁸ thus students' course satisfaction would positively lead to higher learning effectiveness. While teaching is one of the education services teachers provide to their students, it is reasonable to evaluate students' satisfaction on the teaching service quality. Adopting SERVQUAL as the foundation and modifying its five service quality dimensions to match teaching context, we developed our SERVQUAL-like instrument. SERVQUAL is suitable primarily because it helps to measure the quality of teaching,³⁹ and second, four of the five dimensions are related to either pedagogical or "humanification" perspectives, which emphasizes the interaction between students and teachers. Furthermore, the validity and reliability of the adoption of SERVQUAL scale in higher education are validated in prior studies that were conducted in different regions.⁴⁰

3. Research Model and Hypothesis Development

To ensure the fit of the measurement scale with education context, we develop our working definitions of the five service quality dimensions in our study as follows. *Assurance* measures an instructor's domain knowledge and professionalism of the subject domains. *Empathy* evaluates an instructor's provision of individualized attention and care

³⁸ Pan, G., Shankaraman, V., Koh, K. & Gan, S., "Students' Evaluation of Teaching in the Project-based Learning Programme: An Instrument and a Development Process," 100501.

³⁹ Arthur, Y.D., Dogbe, C.S.K. & Asiedu-Addo, S.K., "Modeling Students' Mathematics achievement and Performance through Teaching Quality: SERVQUAL Perspective," *Journal of Applied Research in Higher Education* 14.4(2022): 1509-1523; Gregory, J. L., "Applying SERVQUAL: Using Service Quality Perceptions to Improve Student Satisfaction and Program Image," 788-799.

⁴⁰ Lupo, T., "A Fuzzy ServQual based Method for Reliable Measurements of Education Quality in Italian Higher Education Area," 7096-7110; Stodnick, M., & Rogers, P., "Using SERVQUAL to Measure the Quality of the Classroom Experience," *Decision Sciences Journal of Innovative Education* 6.1(2008): 115-133; Tan, K. C., & Kek, S. W., "Service Quality in Higher Education Using an Enhanced SERVQUAL Approach," 17-24; De Oliveira, O.J. & Ferreira, E.C., "Adaptation and Application of the SERVQUAL Scale in Higher Education," *Proceedings of POMS 20th Annual Conference* (2009) USA, May 2009; Yousapronpaiboon, K., "SERVQUAL: Measuring Higher Education Service Quality in Thailand," *Procedia* 116.2014(2013): 1088-1095.

to students. **Reliability** assesses an instructor's abilities in delivering teaching materials and keeping accurate student records. **Responsiveness** is for the evaluation of an instructor's willingness to provide helping hands to solve student's academic problems. The two essential components of a teaching evaluation instrument, pedagogic and practical, are covered by our proposed measurement, with *Assurance* measuring the pedagogical aspect, and *Reliability* focusing on the practical side of teaching quality. Furthermore, *Empathy* and *Responsiveness* help measure the warmth and helpfulness of an instructor. We measured the role of a teacher as the mediator between service quality dimensions and students' overall satisfaction toward the course. Finally, **Tangible** measures "the teaching/learning aids and facilities provided inside and outside the classroom". Although the provisions of these aids and facilities may not be under teachers' control, it is considered as an integral part of formulating teaching quality because it would affect how teaching and learning proceed. Hence, this study presumes that *Tangible* would affect students' satisfaction to both a teacher's teaching quality and the overall course satisfaction.

Based on this rationale, we developed the research model (Figure 1) and formulated the following seven hypotheses:

Hypothesis 1. Students' perceived *Assurance* quality is positively associated with the satisfaction with instructors' teaching quality.

Hypothesis 2. Students' perceived *Empathy* quality is positively associated with the satisfaction with instructors' teaching quality.

Hypothesis 3. Students' perceived *Reliability* quality is positively associated with the satisfaction with instructors' teaching quality.

Hypothesis 4. Students' perceived *Responsiveness* quality is positively associated with the satisfaction with instructors' teaching quality.

Hypothesis 5. Students' perceived *Tangible* quality is positively associated with the satisfaction with instructors' teaching quality.

Hypothesis 6. Students' perceived *Tangible* quality is positively associated with overall course satisfaction.

Hypothesis 7. Students' satisfaction with teachers' teaching quality is positively

associated with overall course satisfaction.

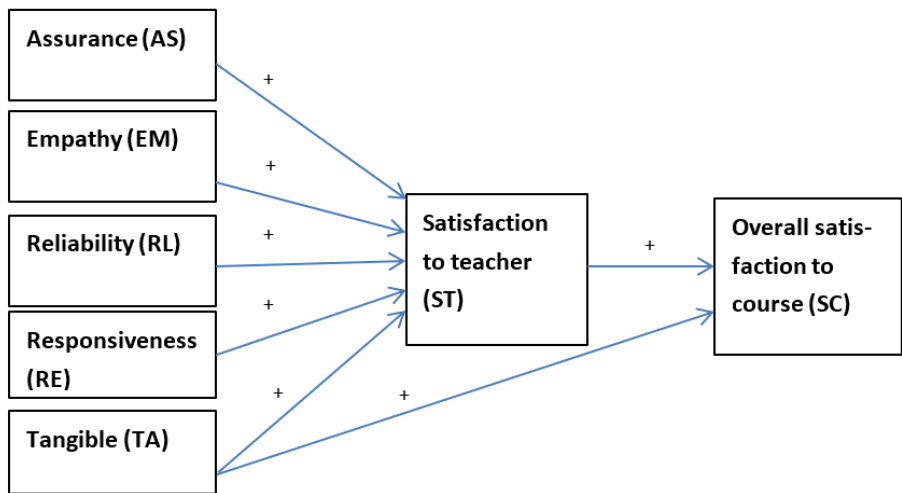


Figure 1. Proposed research model

4. Research Method

4.1. Instrument Development

Our primary objective was to build an evaluation tool to measure students' satisfaction with teaching quality based on the teaching services provided to them. A research model was developed and the corresponding instrument for validation was built. We adopted a systematic and rigorous approach to build the measurement instrument. As described in the previous sections, the SERVQUAL service quality measurement questionnaire was adopted as the basis of our instrument development.

SERVQUAL has been widely used in the service industries. Originally, there were 22 items for the five dimensions in the PZB's SERVQUAL instrument. As the nature of teaching is different from the services in the commercial world, we modified the items to fit the teaching context. Our initial instrument had 25 items for the five dimensions. Similar to most traditional SET instruments, we kept the overall satisfaction with the course instructor and with the course as single items. Several reasons contributed to this decision:

first, the traditional teaching evaluation tools usually only use one item to measure overall satisfaction; second, many prior studies have demonstrated that there is not much difference between a single item and multiple items when measuring overall satisfaction.⁴¹ The original SERVQUAL instrument collects service recipients' feedback from three perspectives-the actual performance, customers' minimum acceptance, and the desired levels. Instead of finding the gaps in service quality, our instrument mainly measured students' perceived satisfactory level of teaching quality for this cross-sectional study.

The validity of SERVQUAL has been confirmed by prior research.⁴² Despite the similarity of our Teaching Quality scale and the SERVQUAL instrument, we conducted systematic procedures to confirm the face validity and content validity of the developed scale. First, we invited a senior researcher to evaluate the face validity of the questionnaire items. Card sorting and pilot tests were then conducted for validity testing of the questionnaire items.⁴³ Two rounds of card sorting were performed. In each round, four junior researchers participated in the activity (these junior researchers were postgraduate students taking a research methodology course in one of the universities in Macau). Ambiguous items were removed or refined until 75% of the judges reached the consent of the items grouped under each dimension. There were 4 to 6 items measuring each dimension, making a total of 23 items for the exogenous variables.

4.2 Instrument Testing-Pilot Test

With these 27 items (23 items for exogenous variables, one single item for each

⁴¹ Nagy, M. S., "Using A Single-item Approach to Measure Facet Job Satisfaction," *Journal of Occupational and Organizational Psychology* 75.1(2002): 77-86; Wanous, J. P., Reichers, A. E. & Hudy, M. J., "Overall Job Satisfaction: How Good are Single-item Measures?" *Journal of Applied Psychology* 82.2(1997): 247-252.

⁴² Carrillat, F. A., Jaramillo, F. & Mulki, J. P., "The Validity of the SERVQUAL and SERVPERF Scales: A Meta-analytic View of 17 years of Re-search Across Five Continents," *International Journal of Service Industry Management* 18.5(2007): 472-490.

⁴³ Moore, G. C. & Benbasat, I., "Development of an Instrument to Measure the Perceptions of Adopting an Information Technology Innovation," *Information Systems Research* 2.3(1991): 192-222; Van Teijlingen, E. & Hundley, V., "The Importance of Pilot Studies," *Social Research Update* 35(2001): 1-4.

endogenous variable, and two items for demographic data), we conducted the pilot study. Our questionnaire items were measured via a five-point Likert scale ranging from strongly disagree, 1, to strongly agree, 5. The pilot test served two purposes. First, it ensured the legibility of the item wording. Second, it helped to ensure the instrument reliability and validity.⁴⁴ Fifty questionnaires were collected for this pilot test. We ran the statistics with SmartPLS 3.0. The values of Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE) were all over the recommended cutoff points. The loadings of three of the items (one from Empathy and two from Reliability) were slightly below the threshold of 0.707, while all other items were higher than the cutoff points. The results demonstrated that the instrument was ready for research model validation through the testing with the two large-scale data collections.

4.3 Data Collection

The refined questionnaire was used for field tests in the fall semester of 2016-2017 and the spring semester of 2022-2023 in one of the universities in Macau. Undergraduates were selected as our target samples. The main reason for excluding postgraduates from this study was to eliminate any confounding factors, such as age and students' comparisons with prior tertiary experiences. Prior approval had been obtained from the instructors for the questionnaire distribution in their classes. We distributed the questionnaires during class breaks. In the 2016-2017 study, 358 valid questionnaires were collected for analysis. In the 2022-2023 study, 220 valid questionnaires were collected. In these two rounds, our research assistants (RAs) clearly explained to the students the purpose of the survey and emphasized that the survey result was independent of the teachers' performance evaluated by the university and was just for research purposes. The RAs emphasized and guaranteed that the questionnaires would not be seen by the instructors, so there would be no chance of being "revenged" even if the evaluation scores were low. The instructors were also asked

⁴⁴ Shi, Z., Kunnathur, A. S. & Ragu-Nathan, T. S., "IS Outsourcing Management Competence Dimensions: Instrument Development and Relationship Exploration," *Information & Management* 42.6(2005): 901-919; Van Teijlingen, E. & Hundley, V., "The importance of pilot studies," 1-4.

to leave the classrooms before the explanation and distribution of the questionnaires. The RAs emphasized that completing the questionnaire was voluntary and the students could leave the questionnaires blank if they wanted. The only demographic information collected in the surveys was gender and year of study.

4.4 Model Testing

We used partial least squares (PLS) structural equation modeling to validate the measurement and structural models. SmartPLS 3.0 was used for the analysis to ensure the conclusions of the structural model were drawn from a valid set of measurement.

4.4.1 Assessment of Measurement Model

We reported the assessment of measurement model based on the 2016-2017 dataset because it was the first round of data collection and the 2022-2023 data collection used the same questionnaire. The measurement model helped to assess the reliability and validity of the questionnaire items and the results indicated that the measurement model was satisfactory. Appendix 1 presents the reliability, convergent validity, discriminant validity and the multicollinearity issues of the measurement tool.

4.4.2 Assessment of Structural Model-Hypothesis Testing

After the confirmation of the measurement reliability and validity, we herein validate the relationship among constructs through the testing of hypotheses. We analyzed the data using SmartPLS 3.0.

For the 2016-2017 dataset, *Satisfaction toward Teacher* was significantly associated with *Assurance* ($\beta=0.210^{***}$), *Empathy* ($\beta=0.288^{***}$) and *Reliability* ($\beta=0.255^{***}$), while *Satisfaction toward Teacher* positively influenced students' *Overall Course Satisfaction* ($\beta=0.662^{***}$). H1-H3 and H7 were supported. However, the relationship between *Responsiveness* and *Satisfaction toward Teacher* was not statistically significant, hence, H4 was not supported. The relationship between *Tangible* and *Satisfaction toward Teacher* was

also statistically insignificant, resulting in the rejection of H5. As expected, *Tangible* significantly influenced students' *Overall Course Satisfaction* ($\beta=0.235^{**}$) H6 was supported. The R2 values indicated that exogenous variables explained 45.4% of the variation in *Satisfaction toward Teacher* and 60.1% of the variation in *Overall Course Satisfaction*.

For the 2022-2023 dataset, similar results were found except for one, i.e., the insignificance of *Assurance* on the *Satisfaction toward Teacher* ($\beta=-0.083$ n/s). As shown in the left column of Table 1, *Satisfaction toward Teacher* was statistically impacted by *Empathy* ($\beta=0.448^{**}$) and *Reliability* ($\beta=0.306^{*}$), while *Responsibility* and *Tangible* retained the same insignificant results as the 2016-2017 dataset. *Tangible* significantly influenced *Overall Course Satisfaction* ($\beta=0.113\#$), but not *Satisfaction toward Teachers*. The high coefficient of *Satisfaction toward Teacher* on *Overall Course Satisfaction* ($\beta=0.750^{***}$) further demonstrated the important role of teacher in influencing the *Overall Course Satisfaction*. In this cohort, 48.6% of the variation in *Satisfaction to Teacher* and 63.5% of the variation in *Overall Course Satisfaction* were explained by the exogenous variables. The results of both datasets are summarized in Table 1.

Table 1. Results of hypothesis testing

		2016-2017 Dataset			2022-2023 Dataset		
		Path Coefficient β	t-statistics		Path Coefficient β	t-statistics	
H1	AS -> ST	0.210***	3.595	Supported	-0.083 ns	0.463	Not supported
H2	EM -> ST	0.288***	4.684	Supported	0.448**	2.668	Supported
H3	RL -> ST	0.255***	3.968	Supported	0.306*	2.113	Supported
H4	RE -> ST	0.024 ns	0.428	Not supported	0.049 ns	0.303	Not supported
H5	TA -> ST	-0.013 ns	0.288	Not supported	0.050 ns	0.751	Not supported
H6	TA -> SC	0.235**	3.245	Supported	0.113#	1.894	Supported
H7	ST -> SC	0.662***	10.052	Supported	0.750***	12.546	Supported

Note: ***, **, *, and # denote 0.1%, 1%, 5%, and 10% levels of significance, respectively. AS: Assurance; EM:

Empathy; RL: Reliability; RS: Responsiveness; TA: Tangible; SC: Overall Satisfaction to the Course; ST: Satisfaction to Teacher.

To further evaluate the mediating effect of *Satisfaction toward Teacher* on the *Overall Course Satisfaction*, we compared the direct effect and indirect effect of the paths (Zhao et al., 2010). Table 2 and 3 show the direct and indirect effects between the independent variables (IVs) and the dependent variable (DV) of the 2016-2017 and 2022-2023 datasets respectively. According to the approach proposed by Zhao and his colleagues in 2009, we found different mediating effects in the two datasets. *Satisfaction toward Teacher* partially mediated the relationship between *Empathy/Reliability* and *Overall Course Satisfaction* in the 2016-2017 dataset,⁴⁵ while the effects exhibited full mediation in the 2022-2023 dataset.⁴⁶ No mediating effect from *Satisfaction toward Teacher* was found in the relationship between *Responsiveness/Tangible* and *Overall Course Satisfaction*.⁴⁷ In the 2016-2017 dataset, *Satisfaction toward Teacher* fully mediated the relationship between *Assurance* and *Overall Course Satisfaction*,⁴⁸ while in the 2022-2013 dataset, the mediating effect become insignificant.

Table 2. Direct and indirect effects of the 2016-2017 dataset

Path	Path Coefficients β	t-statistics	p-values
ST->SC	0.662***	10.052	0.000
AS->SC	0.092	1.210	0.227
AS->ST	0.210***	3.595	0.000
AS->ST->SC (Indirect Effect)	0.139***	3.320	0.001
EM->SC	0.292**	3.272	0.001
EM->ST	0.288***	4.684	0.000
EM->ST->SC	0.191***	4.142	0.000

⁴⁵ Partial mediating effects were evidenced by “both direct effects and indirect effects were significant”.

⁴⁶ Full mediating effect was evidenced by “The relationships between Empathy/Reliability and Satisfaction toward Teacher; Satisfaction toward Teacher and Overall Course Satisfaction are significant while the direct effect of Empathy/Reliability on Overall Course Satisfaction are non-significant.”

⁴⁷ No mediating effect was found because “The indirect effects were non-significant”.

⁴⁸ Full mediating effect was evidenced by “The relationships between Assurance and Satisfaction toward Teacher; Satisfaction toward Teacher and Overall Course Satisfaction are significant while the direct effect of Assurance on Overall Course Satisfaction are non-significant”.

(Indirect Effect)			
RE->SC	-0.072	1.368	0.171
RE->ST	0.024	0.428	0.669
RE->ST->SC (Indirect Effect)	0.016	0.425	0.671
RL->SC	0.220**	2.890	0.004
RL->ST	0.255***	3.968	0.000
RL->ST->SC (Indirect Effect)	0.169***	3.693	0.000
TA->SC	0.203*	2.212	0.027
TA->ST	-0.013	0.288	0.774
TA->ST->SC (Indirect Effect)	-0.009	0.283	0.777

Note: ***, **, *, # denote 0.001, 0.01, 0.05 and 0.1 level of significance. AS: Assurance; EM: Empathy; RL: Reliability; RS: Responsiveness; TA: Tangible; SC: Overall Satisfaction to the Course; ST: Satisfaction to Teacher.

Table 3. Direct and indirect effects of the 2022-2023

Path	Path Coefficients β	t-statistics	p-values
ST->SC	0.750***	12.546	0.000
AS->SC	-0.073	0.504	0.614
AS->ST	-0.083	0.463	0.643
AS->ST->SC (Indirect Effect)	-0.062	0.466	0.641
EM->SC	-0.037	0.231	0.818
EM->ST	0.448**	2.668	0.008
EM->ST->SC (Indirect Effect)	0.336	2.634	0.008
RE->SC	0.083	0.572	0.567
RE->ST	0.049	0.303	0.762
RE->ST->SC (Indirect Effect)	0.037	0.305	0.760
RL->SC	0.024	0.149	0.873
RL->ST	0.306*	2.113	0.035
RL->ST->SC (Indirect Effect)	0.229	2.093	0.036
TA->SC	0.113#	1.894	0.058
TA->ST	0.050	0.751	0.452
TA->ST->SC (Indirect Effect)	0.038	0.773	0.440

Note: ***, **, *, # denote 0.001, 0.01, 0.05 and 0.1 level of significance. AS: Assurance; EM: Empathy; RL:

Reliability; RS: Responsiveness; TA: Tangible; SC: Overall Satisfaction to the Course; ST: Satisfaction to Teacher.

5. Discussion

The goal of this study is to measure students' satisfaction with the course through their perception of teaching quality from the lens of the five dimensions. Built on the well-known SERVQUAL measurement, our SERVQUAL-like teaching quality instrument items were revised from the teaching and learning perspective. The reliability and validity of the proposed instrument were ensured, and the results of this study provide notable insights to both academic and higher educational institutions.

5.1 Key Findings

We first discuss the 2016-2017 findings, then followed by the 2022-2023 findings.

5.1.1 The Impact of Empathy and Reliability dimensions on Satisfaction with Teaching Quality

Among all the dimensions of the 2016-2017 cohort, *Empathy* ($\beta=0.288^{***}$) and *Reliability* ($\beta=0.254^{***}$) are the most significant factors influencing students' satisfaction with teaching quality. A teacher's *Reliability* is defined as a teacher's ability to deliver teaching materials and keep accurate records, while *Empathy* is measuring the teacher's understanding of students' needs. These two dimensions measure both the practical and emotional perspectives of a teacher's teaching quality.

Reliability is important to students because no matter how well the teaching materials are written or how knowledgeable the teachers are, if the teachers cannot deliver the materials in a logical and understandable way, the students will, almost for sure, not appreciate the value of attending classes. Furthermore, keeping accurate records helps ensure that the students are fairly treated. Reliability is thus important because mutual trust

can be built.⁴⁹ As teachers' possession of professional knowledge is critical to help equip students, students would feel more confident when they perceive that the knowledge they gain from their teachers is applicable and contributable to their future career. For most students, teachers' understanding of their needs is important.⁵⁰ Feeling that their teachers are walking alongside them down the academic road would probably, especially when they are in need of teachers' help, make them feel more comfortable in studying; perceived *Empathy* is, therefore, important in providing emotional support for their studies.

For the 2022-2023 cohort, the students had experienced one of the toughest times in their study, i.e., the COVID-19 pandemic. This group of students had to attend online classes for more than a year, having no physical interactions with their teachers and fellow classmates. The path coefficients of *Empathy* and *Reliability* in this cohort were higher than the values for the 2016-2017 cohort (*Empathy*: $\beta=0.448^{**}$ (2023) vs $\beta=0.288^{***}$ (2017); *Reliability*: $\beta=0.306^{*}$ (2023) vs $\beta=0.255^{**}$ (2017)). The pandemic is therefore believed to be one of the major attributes causing *Empathy* and *Reliability* to become so important because these two dimensions have shown the needs of humanification in the interactions between students and teachers.

5.1.2 The Impact of Responsiveness dimension on Satisfaction with Teaching Quality

The results of both datasets revealed that there was no statistically significant relationship between *Responsiveness* and Satisfaction with teaching quality. In our working definition, *Responsiveness* mainly refers to teachers' responsiveness and willingness to answer students' questions. The reasons attributed to the non-significance were partially due to the students' unwillingness to ask questions, especially in classes. The data were collected in a university located in Macau and all respondents were Chinese. It is commonly

⁴⁹ Lee, S.J., "The Relations Between the Student-teacher Trust Relationship and School Success in the Case of Korean Middle Schools," *Educational Studies* 33.2(2007): 209-216; Wey, H.W., "Difficulties of Beginning Teachers," *The School Review* 59.1(1951): 32-37.

⁵⁰ Espinoza, O. & McGinn, N., "Graduates' Satisfaction as a Measure of Quality: Evidence from Two Programs in Three Chilean Universities," *International Journal of Education Research* 90(2018): 33-143.

believed that many Asian students prefer to attend class quietly.⁵¹ Some of them even have a “leave me alone” desire and are resistant to any questions asked by their teachers. Such unwillingness to answering questions could explain the non-significant relationship between *Responsiveness* and students’ satisfaction with teaching quality. Another possible reason is that many students prefer to work independently to find answers on their own rather than just approaching their teachers for solutions. When students cannot seek out answers, fellow classmates will be their first targets to have discussions with before going to their teachers. All these attribute to the non-significance of this hypothesis.

5.1.3 The Impact of Tangible dimension on Satisfaction with Teaching Quality

Among the five service quality dimensions, *Tangible* is the one which focuses on the physical and tangible aspect (as reflected by the term) in evaluating service quality. In our study, we focused on measuring the facilities provided by the universities to facilitate better learning experiences. Although we hypothesized a positive relationship between *Tangible* and Satisfaction with teaching, the results did not support our inference. One possible reason is Satisfaction with teaching is evaluated by the students through an affective perspective, while *Tangible* is considered as the “hardware” of the universities; therefore, it may have a trivial impact on students’ feelings toward their teachers’ teaching.

5.1.4 The Impact of Assurance dimension on Satisfaction with Teaching and Overall Course Satisfaction

Both datasets reveal that there is no direct relationship between *Assurance* and Overall Course Satisfaction. For the 2016-2017 cohort, the relationship between *Assurance* and Overall Course Satisfaction was fully mediated by Satisfaction with teaching, while in the 2022-2023 cohort, there was neither a direct nor an indirect effect between these two

⁵¹ Tran, T.T.T., “Is the Learning Approach of Students from the Confucian Heritage Culture Problematic?” *Education Research for Policy and Practice* 12(2012): 57-65.

constructs. We believe the pandemic would have an impact on the 2022-2023 cohort. As mentioned, the 2022-2023 group of students had experienced the toughest time in learning and had attended hundreds of hours of online classes, which may have developed their habits and practices of searching the Internet for information on their own. The role of teachers as the sole and primary knowledge sources may have been weakened. For the 2016-2017 cohort, students still adhered to environments where teachers were around them physically; thus, their reliance of knowledge acquisition from teachers might be much stronger than the 2022-2023 cohort.

5.2 Implications

For most potential students, their intention to study at a university is heavily influenced by the perceived fame of the university. Word of mouth from alumni contributes considerably to such perceived fame. Prior studies (such as (55)) have indicated that students' satisfaction toward their university is associated with their perceived quality of teaching.⁵² Our findings reveal that the impacts of *Assurance*, *Reliability*, and *Empathy* on Overall course satisfaction are mediated by the satisfaction toward teachers' teaching quality; hence, the role of teachers in influencing the fame of a university can never be neglected.

The responses from the survey instrument may not easily provide exact answers to our second research question, RQ2: "What roles do teachers play in influencing overall course satisfaction?". However, with the aggregation of the responses and the mediating effect analysis, we can gather statistical evidences to support our claim that teachers are the important bridges between students and the course. Courses are somewhat "static", and the dynamic delivery of course content to the recipients relies on a medium - teachers are key media.

⁵² Eom, S.B., Wen H.J. & Ashill, N., "The Determinants of Students' Perceived Learning Outcomes and Satisfaction in University Online Education: An Empirical Investigation," *Decision Sciences Journal of Innovative Education* 4.2(2006): 215-235; Espinoza, O. & McGinn, N., "Graduates' Satisfaction as A Measure of Quality: Evidence from Two Programs in Three Chilean Universities," 33-143.

In contrast to our hypothesis, there was no impact of *Tangible* on satisfaction with teaching quality. Although we inferred that the physical classroom environment could influence teaching quality, our findings reveal that students would not measure teaching quality based on the external environment. What the students treasure is the teachers’ personal “soft-side” of teaching, and it is evidenced by the positive relationship of *Empathy* and *Reliability* on Satisfaction with teaching. However, when measuring students’ overall course satisfaction, the impact of physical environment still plays a significant role because high-quality computers, good classroom equipment and environment would provide a better atmosphere for students to learn effectively and efficiently.

To our surprise, our findings reveal no statistic relationship between *Responsiveness* with either overall course satisfaction or teaching quality. The reasons for this finding can be many-fold. First, the non-significance of this hypothesis (H4) may be due to the crowding by other hypotheses. Second, unlike *Empathy* and *Reliability*, *Responsiveness* involves actions from students, i.e., they have to ask questions to get responses from their teachers. In Asia, many students are quite passive and dare not to ask questions, which could create the hypothesis non-significance. To address this, teachers should find ways to encourage more academic interactions with their students.

The study contributions are twofold. Theoretically, we proposed a research model based on the belief that teaching is considered as one type of services. With the PZB service quality framework as the foundation, the five teaching service quality dimensions were hypothesized as predicting variables to predict satisfaction with teaching quality and overall course satisfaction. Satisfaction with teaching quality was conceptualized as the mediator to impact on overall course satisfaction. This provides another angle to evaluate a course based on teaching services provided by individual teachers.

Practically, our results reveal several findings which would shed light on improving teaching quality. First, our findings demonstrate the importance of teachers as bridges to improve overall course satisfaction. The roles of good teachers should never be neglected even though many tertiary education institutions place their top priority as evaluating their academic staff members in terms of publication outputs. Even university rankings are

important indicators of the fame of the university, alumni's word of mouth also plays an important role in formulating fame. It is quite often when we hear alumni accrediting their alma mater with "our teachers are excellent" instead of "our university is good at research". Furthermore, our results show that teaching quality mediates the relationship between *Assurance/Empathy/Reliability* and overall course satisfaction. It evidences that through the effort of teachers, the impact of these factors can be exhibited.

Second, *Tangible* quality positively impacts on overall course satisfaction. A better environment and good teaching/learning facilities can create better learning experiences, which will ultimately increase the overall course satisfaction. Thus, in addition to recruiting good faculties, it is essential to provide a comfortable and practical learning environment for students. The provision of appropriate and high-quality digital devices and learning aids may help in achieving this. Nevertheless, between teaching quality and tangible quality, our findings show that teaching quality weighs much more heavier than tangible quality on overall course satisfaction ($\beta=0.662$ vs. $\beta=0.235$ and $\beta=0.750$ vs. $\beta=0.113$ for the 2016-2017 and 2022-2023 cohorts, respectively). It further demonstrates the significant importance of good teachers. Consequently, a university should invest more in retaining good teachers than renovating the campus if resources are limited.

The results show that *Empathy* and *Reliability* are weighed similarly. We can conclude that, in the surveyed university, the students considered these two dimensions as equally important. The non-significance of *Responsiveness* and the different levels of *Assurance* in the two cohorts impacted on satisfaction toward teaching quality, also providing an interesting implication for our future research.

Finally, a suggestion based on the findings is given to the Early Career Faculty. Early Career Faculty members face many challenges as they may find it difficult to focus on all aspects of teaching. A "Pareto Solution" approach may be applied. As discussed in a 1951 paper,⁵³ the difficulties new teachers face include "adapting to the needs, interest, and abilities of [students] and motivating [students'] interest and response" and "keeping

⁵³ Wey, H.W., "Difficulties of Beginning Teachers," 32-37.

records and making reports" (57. p,34).⁵⁴ Together with the evidence of our findings, we will suggest new faculties focus on "caring" (i.e., the *Empathy* quality) and on being "true to their words" (i.e., the *Reliability* quality). Being caring does not mean that new faculties have to be friends with students. Instead, they should understand students' problems and needs and deal with them in an adult, professional,⁵⁵ but also caring way. *Reliability* quality is important not only in primary and secondary schools,⁵⁶ but also tertiary education. New career faculties should make sure that student records are accurate, and tests are correctly marked. Trust between new teachers and their students can then be developed. New teachers also have to stand firm in their well-designed assessment methods to demonstrate fairness to all of their students. However, focusing on *Empathy* and *Reliability* does not mean that other aspects can be given up (so not exactly a Pareto solution); *Assurance* and *Responsiveness* must be maintained at an acceptable level.

All studies have their limitations. The data were collected from a single university in Macau, and all of the survey respondents were undergraduate students. The first limitation comes from the sample representativeness. It is therefore important for us to carry out further studies to ensure the generalizability of the study. Second, there are differences in attitude between undergraduate and postgraduate students. Studies comparing undergraduates and postgraduates can provide more information to academics to understand the needs and expectations of these two groups, thus fostering better student-centered learning experiences. Cultures may have an impact on students' perception of the five quality dimensions, which may have influences on the relationship between the quality dimensions and satisfaction. Thus, surveys conducted in places with different cultures will further increase the generalizability of this study.

⁵⁴ Wey, H.W., "Difficulties of Beginning Teachers," 32-37.

⁵⁵ Wey, H.W., "Difficulties of Beginning Teachers," 32-37.

⁵⁶ Lee, S.J., "The Relations between the Student-teacher Trust Relationship and School Success in the Case of Korean Middle Schools," 209-216; Goodard, R.D., Tschannen-Moran, M. & Hoy, W.K., "A Multilevel Examination of the Distribution and Effects of Teacher Trust in Students and Parents in Urban Elementary Schools," *The Elementary School Journal* 102.1(2001): 3-17.

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Appendix 1

1. Assessment of Measurement Model

We reported the assessment of measurement model based on the 2016-2017 dataset because it was the first round of data collection and the 2022-2023 data collection used the same questionnaire. The measurement model helped to assess the reliability and validity of the questionnaire items. Based on the indicator loadings of the original 23 items, we found that the loadings of three of the items were below the threshold of 0.7 (one from Reliability and two from Responsiveness). We then removed these three items for our data analysis because these items have low association with other items under the same construct. Tables A1 to A3 present the reliability and validity of the measurement tool.

As shown in Table A1, factor loading scores of the constructs on the expected factors were all higher than the 0.7 threshold.⁵⁷ The factor loading scores were also higher than other factors. We measured the instrument reliability with indicator outer loadings, composite reliability (CR), and Cronbach's alpha. Table A2 shows that the values of Cronbach's alpha and CR all exceeded 0.70,⁵⁸ indicating that the internal consistency reliability of our measurement items was ensured.

Convergent validity of the measurement items was tested with CR and Average Variance Extracted (AVE) values. Table A2 shows that the CR values of the exogenous variables ranged from 0.872 to 0.926, higher than the recommended 0.70 threshold, and all AVEs were higher than 0.50 (ranging from 0.631 to 0.758).⁵⁹ The results suggest that the instrument demonstrated convergent validity.

⁵⁷ Hulland, J., "Use of Partial Least Squares (PLS) in Strategic Management Research: A Review of Four Recent Studies," *Strategic Management Journal* 20.2(1999): 195-204.

⁵⁸ Hair, J., Hollingsworth, C. L., Randolph, A. B. & Chong, A. Y. L., "An Updated and Expanded Assessment of PLS-SEM in Information Systems Research," *Industrial Management & Data Systems* 117.3(2017): 442-458; Nunnally, J.C. & Bernstein, I.H., "The Assessment of Reliability," *Psychometric Theory* 3(1994): 248-292.

⁵⁹ Hair, J., Hollingsworth, C. L., Randolph, A. B. & Chong, A. Y. L., "An Updated and Expanded Assessment of PLS-SEM in Information Systems Research," *Industrial Management & Data Systems* 117.3(2017): 442-458; Fornell, C. A. & Larcker, D. F., "Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics," *Journal of Marketing Research* 18.3(1981): 382-388.

For discriminant validity, we can see from Table A3 that the AVE square root values were higher than the corresponding construct correlations. Variance Inflation Factor (VIF, the measure of multicollinearity in regression analysis) values of each construct fell below the cutoff point of 5,⁶⁰ demonstrating that there was no multicollinearity among the constructs.

Table A1. Confirmatory factor analysis.

	1	2	3	4	5	6	7
AS1	0.783	0.468	0.63	0.506	0.359	0.502	0.418
AS2	0.834	0.526	0.598	0.636	0.372	0.457	0.393
AS3	0.812	0.646	0.613	0.532	0.368	0.513	0.391
AS4	0.835	0.519	0.606	0.441	0.392	0.486	0.416
EM1	0.504	0.862	0.54	0.562	0.386	0.551	0.479
EM2	0.547	0.897	0.544	0.562	0.456	0.516	0.481
EM3	0.571	0.839	0.52	0.524	0.476	0.453	0.438
EM4	0.667	0.850	0.634	0.6	0.499	0.545	0.512
RL1	0.629	0.576	0.839	0.537	0.412	0.55	0.476
RL2	0.583	0.491	0.808	0.429	0.323	0.495	0.464
RL4	0.57	0.505	0.777	0.511	0.316	0.441	0.372
RL5	0.605	0.494	0.751	0.527	0.271	0.439	0.314
RS2	0.567	0.534	0.588	0.862	0.306	0.474	0.357
RS3	0.578	0.559	0.541	0.872	0.297	0.435	0.332
RS4	0.518	0.575	0.51	0.881	0.282	0.411	0.323
RS5	0.584	0.612	0.544	0.867	0.309	0.428	0.327
TA1	0.328	0.401	0.293	0.241	0.836	0.222	0.312
TA2	0.365	0.482	0.304	0.254	0.871	0.271	0.394
TA3	0.418	0.493	0.392	0.336	0.880	0.356	0.449
TA4	0.421	0.396	0.418	0.317	0.808	0.312	0.406
ST	0.602	0.602	0.609	0.503	0.349	1	0.745
SC	0.496	0.556	0.517	0.386	0.467	0.745	1

⁶⁰ Ringle, C., da Silva, D. & Bido, D., "Structural Equation Modeling with the SmartPLS," *Brazilian Journal of Marketing* 13.2(2014): 56-73.

Table A2. Composite reliability, AVEs, and Cronbach’s alpha.

Construct	Composite Reliability (CR)	AVE	Cronbach’s Alpha
Assurance	0.889	0.666	0.833
Empathy	0.921	0.744	0.885
Reliability	0.872	0.631	0.805
Responsiveness	0.926	0.758	0.894
Tangible	0.912	0.721	0.872

Table A3. Descriptive Statistics, VIF, correlations, and square roots of AVEs.

	Mean	SD	VIF	1	2	3	4	5	6	7
1.AS	4.473	0.678	2.804	0.816						
2.E M	4.043	0.889	2.475	0.663	0.862					
3.RL	4.355	0.748	2.631	0.751	0.651	0.794				
4.RS	4.335	0.804	2.118	0.646	0.654	0.629	0.870			
5.TA	4.053	0.944	1.432	0.457	0.525	0.421	0.344	0.849		
6.SC	4.149	0.853	1.139	0.496	0.556	0.517	0.386	0.467	1	
7.ST	4.265	0.749	1.139	0.602	0.602	0.609	0.503	0.349	0.745	1

Notes: 1. AS: Assurance; EM: Empathy; RL: Reliability; RS: Responsiveness; TA: Tangible; SC: Overall Satisfaction to the Course; ST: Satisfaction to Teacher.

Notes: 2. Bolded and italicized diagonal elements are the square roots of AVEs.

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