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New Idea of University: “Sharing Teachers’ Errors”—Based on Collingwood and Popper’s Theory of Knowledge

ZHOU Zhifa, CHEN Li
Zhejiang Normal University, Jinhua, China
LV Xinrui
Changting No. 1 Middle School of Fujian, China

The development of world-class university is closely related to the development of their ideas. Based on Collingwood and Popper’s theory of knowledge and the development of several specific cases of university discipline, the paper has summed up the unique idea of university, “Sharing Errors”. i.e., in the disciplinary society, academic authority of leaders is not whether he makes mistakes or not, but rather can continue to make incorrect and innovative assumptions, and inspire the team by sharing errors. The quality and quantity of errors shared by the leader is a sign of exuberant vitality of his science. From a methodological sense, the idea of “sharing errors” is consistent with the basic method of “trial and error”; from the evaluation system, the history of science shows that a lot of scientists became a professor because of relying on a number of the incorrect and innovative assumptions. From the perspective of disciplinary development, when errors lack novelty, the discipline will gradually become weak; from the perspective of science policy, the new idea of university requires to respect the scientists’ right of trial and error. If China wants to create world-class universities, practicing the spirit of sharing errors between teacher and student is necessary.

Keywords: world-class universities, idea of university, sharing errors, scientific policy

Introduction

Creating world-class universities is a Chinese dream of a hundred years. The “211 Project” and “985 Project” issued in the 1990s marked the opening of China’s striving for creating world-class universities. In 2006, Premier Wen Jiabao met six university presidents and education experts in Conference Room 4 of the State Council and said when he visited Qian Xuesen last year, Qian pointed out that one of the main reasons why China was not fully developed was that none of the universities could operate in accordance with the model of cultivating talents with science and technology, so that it couldn’t create innovative technology and train prominent students. Without its own unique innovative things, it is always unable to “emerge” outstanding talents. The outstanding talents mentioned by Qian are not ordinary talents, but master talents. The number of students is increasing and the scale of schools is expanding as well. However, the question is how to cultivate more outstanding talents.

ZHOU Zhifa (Corresponding author), Ph.D., Associate Professor, Institute of African Studies, Zhejiang Normal University, Jinhua, China.
CHEN Li, Postgraduate, Institute of African Studies, Zhejiang Normal University, Jinhua, China.
LV Xinrui, Master of Comparative Education, Changting No. 1 Middle School of Fujian, China.

“It’s a question I am very anxious about” (Sina News, 2006). Actually, creating the world-class universities means more master-level students appear constantly. Then, how could universities cultivate talents? In other words, what kind of environment is needed for the cultivation of master talents? “If you want to know where you’re going, history helps you know where you’ve been” (Clark, 1984, p. 50). This paper follows the historical development of the idea of universities, explaining why German universities maintained a leading position in the world in the 19th century and even the first 30 years of the 20th century, and why American universities became the world’s scientific research centers in the 1930s.

Although the western concept of university can explain why it has become the world-class university, this paper argues that the concept of university elaborated by many western scholars is not based on the new epistemology of R. G. Collingwood and Karl Popper, which means it’s not complete enough. Based on the concept of “quasi-Popper knowledge” and the specific case of the development of college physics (Zhou, 2007), this paper puts forward the new concept of “sharing errors”, that is, in the discipline community, the authority of an academic leader doesn’t mean reducing errors, instead, it plays a key role in putting forward “novel false assumptions” continuously and sharing them with the team so as to inspire thinking of the whole team. “Authority” implies that the “novel but false hypothesis” the master proposes is world-class, which necessarily encourages students to challenge authority, because they are good at proposing false assumptions rather than truths. The new university idea of “sharing errors” means that the connotation of the traditional concept of teachers is changed.

Literature Review: The Establishment of World-Class Universities

Scientific centers symbolizing Western civilization have appeared in different countries like torchbearers since the Renaissance in Europe. In the 16th century, Italy was the scientific center of the world, and by the 17th and early 18th centuries it had moved to the British Isles. France led the world in science in the late 18th and early 19th centuries. During the next hundred years, from 1830 to 1930, German universities became the kingdoms of the world’s scientific development. At the beginning of the 1930s, the United States became the center of scientific development in the world. American researches in some fields of some applied sciences paralleled with that of Britain, France, and Germany as early as 1900. However, it took more than a hundred years, roughly between 1815 and 1930, for American scientific achievement to reach the same level of excellence. Especially after World War II, the use of atomic energy marked the shift of the center of international scientific community to the United States. Subsequent decades of development have further demonstrated that the excellence achievement made by American science is not due to the destruction of knowledge in the European continent, nor is it simply because outstanding European scientists seek political asylum in the United States, or formulating emergency plans for the wars. The fundamental reason is that American universities have maintained a strong and persistent initiative in the field of science. Then, why did German universities stand out in the 19th century and dominate the first three decades of the 20th century? Why did American universities begin to become the world’s science centers in the 1930s? There are many reasons, among which the development of university concept is closely related.

The rise of German science is closely related to Wilhelm von Humboldt’s concept of University. From 1809 to 1810, Humboldt founded the University of Berlin when he was the director of the Department of Culture and Education of the Prussian Ministry of the interior. On the one hand, Humboldt inherited the educational philosophy of medieval universities, that is, universities are “societies of scholars”, enjoying a certain degree of autonomy and academic freedom (Liu, 2004). On the other hand, he introduced the function of scientific research into universities. "The fundamental principle of establishing oneself is to cultivate science in the deepest and broadest sense and make it serve both the spiritual and moral education of the whole nation" (Von Humboldt, 1810, pp. 1648-1815). However, the science referred to by Humboldt is pure science. "If institutions of higher education want to achieve their goals, the staff (if possible) must embrace the concept of pure science" (Von Humboldt, 1810, pp. 1648-1815). It should be noted that universities before the 19th century were known as "Teaching Universities". Therefore, Humboldt advocated the university concept of integrating teaching and scientific research in the early 19th century, which is undoubtedly ahead of other countries in the world. By the middle of the 19th century, John Henry Newman, a famous British theologian, writer, and educator, even insisted that teaching was the only function of a university in his book *The Idea of a University*, which was quite out of keeping with the time (Newman, 1990).

As for the United States, from the colonial period to the 1960s, scientific research did not become the fundamental function of American universities. In the early 19th century, American higher education largely cultivated priests, so subjects such as theology, classics, and moral philosophy dominated, with many future scientists first pursuing medical studies. In the decade after the Civil War, the scientific workforce, including amateurs, numbered about 2,000, among which about 500 are serious researchers (Kevles, 1978, p. 3). It was until the 1860s that botany, chemistry, astronomy, geology, and physics were formally introduced into the curriculum at private colleges (Oleson & Brown, 1976, pp. 38-39, p. 52, p. 57). It can be said that before the founding of Johns Hopkins University in 1876, American universities basically belonged to teaching-oriented universities. The whole American higher education system is not a center for research, but a place for imparting general knowledge. It can be seen that American universities lag behind German universities in pure research because of the idea of university.

On the other hand, American public universities introduced the function of public service into universities, thus expanding the functions of universities. *The Morril's Act*, enacted in 1862, changed the functions of traditional American universities and transformed public higher education from single teaching to teaching and public services. In the early 20th century, the pragmatism advocated by *Morrill Act* was fully practiced by Charles Richard Van Hise, President of Wisconsin University. In his view, teaching, scientific research, and public service are the main functions of universities. More importantly, as a state university, it must consider the practical value of each social function (Kang, 1988). In other words, teaching, scientific research, and service should take the actual needs of the state into account. Obviously, the introduction of the *Morrill Act* is connected with traditional American pragmatism philosophy, which has a dual impact on the development of material science in American universities. In a negative sense, pragmatism enables American science to be heavily dependent on European theoretical achievements. In a positive sense, experimental science in American universities has always been prosperous, while the prosperity of practical science has laid the foundation for economic development, which provides impetus for nourishing education and basic research in return. After World War I, various American charitable foundations realized the importance of pure research for military and industrial development of the United States, and began to provide rich research funds and postdoctoral scholarships for universities. The dominance of fundamental research in German research universities was so overwhelming that it hindered the development of applied science and fell into the dilemma of shortage of research funds. By the early 1930s, American universities, after making up for the shortcomings of pure research in the 1920s, combined the advantages of traditional experimental science and created a new discipline—"Big Science". In this way, it became the science research center all over the world (Zhou & Kong, 2009).

In the process of countries striving for world-class universities in the 20th century, many scholars have expounded the concept of universities: *Idea of the University* by Karl Jaspers (1923), *The Mission of the University* by Ortega Y. Gasset (1930, p. 1), and *The Modern University: A Study of Universities in America, Britain and Germany* by Abraham Flexner (1930, pp. 178-179), *The University of Utopia* by Robert M. Hutchins (1936, p. 41), and *Uses of the University* by Clark Kerr (2001), whose philosophical basis can be divided into "epistemology" and "political theory". Clark Kerr put forward "The Idea of a Multiversity" (Kerr, 2001, p. 3). However, under the background of academic freedom and academic autonomy, the above works failed to answer why some discipline leaders can lead the discipline team to explore the territory of knowledge while some discipline leaders were just outstanding themselves and lack of successors. This paper holds that the university concept of many scholars above mainly adheres to the traditional concept of knowledge, that is, knowledge is Justified True Belief (Gettier, 1963, pp. 121-123), but it fails to enrich the connotation of university concept from new epistemology, such as Collinwood and Popper's epistemology.

"Sharing Errors": The New Idea of University From Collingwood and Popper's Theory of Knowledge

Starting from Plato, western traditional epistemology, including Immanuel Kant, defined that knowledge is a defended true belief, which is characterized by proposition. The British scholar Collingwood was the first to question the "propositional logic" of traditional knowledge in western philosophy. He put forward a new concept of knowledge for the first time: "knowledge includes not only 'proposition', 'statement', 'judgment', or any name used by logicians to specify the rules of ideological statement, but also the questions intended to be answered by statements and propositions" (Collingwood, 2013, p. 33). He holds that "Knowledge includes not only 'proposition', 'statement', 'judgment', or any name logicians use to specify rules concerning statements of thought, but also the questions which statements, propositions are intended to answer" (Collingwood, 2013, pp. 33-35). Collingwood believes that propositions are contradictory or true or false only when they solve problems. Therefore, Coriolis put forward "logic of question and answer": each proposition answers a question strictly related to itself (Collingwood, 2013, pp. 33-37), that is, the question and answer are strictly related. "Question and answer logic" by Collingwood pointed out that the concept of knowledge itself contains problems, which is not simply composed of propositions. Although "question and answer logic" (Q&A) logic has influenced the hermeneutics of Hans Georg Gadamer (1983, pp. 39-42), its contribution to epistemology has been ignored so far.

Karl Popper, a philosopher of science, was the representative figure who made the most profound criticism of traditional knowledge theory. From solving Hume's problem of induction, he put forward that knowledge is a kind of conjecture and hypothesis, which deviates from the "essentialism" tendency of traditional epistemology. He systematically discussed the general theory of knowledge, "the growth of knowledge is the development from old problems to new problems with the help of conjecture and refutation: '…P1—TT—EE—P2…'." (Popper, 1979, p. 258). The problem (P1) gives rise to an attempt to solve it with a tentative theory (TT), which must undergo a critical process of error elimination (EE). Popper went so far as to suggest that animals and even plants solve their problems by competing tentative solutions and eliminating errors (Popper, 1979, p. 145). Based on Collingwood's theory of knowledge above, knowledge can be thought of as being composed of "P1—TT—EE—" meaning that "question and answer logic" consists of "the questions and the defended hypothesis proposed to solve the problem". But the "question and answer logic" is not enough to express Popper's complete understanding of knowledge. The growth of knowledge obviously includes another part of "question and answer logic", namely "...P1", that is, "problems and reasons supporting the truth of it" constitute another part of a type of knowledge. Therefore, Popper's general theory of knowledge can be interpreted as that the progress of knowledge is promoted by the alternating action of "A&Q logic" and "Q&A logic" (Zhou, 2007). Based on the two basic types of knowledge, the concept of "quasi-Popper knowledge" can be defined as: "knowledge is a defended hypothesis raised around a problem" (Zhou, 2007).

The quasi-Popper concept of knowledge not only agrees with Collingwood's inclusion of problems into the concept of knowledge, but also believes that finding problems and demonstrating the truth itself may be a kind of knowledge. Albert Einstein believed that:

> raising a problem is more important than solving a problem, because solving a problem may only be a mathematical or experimental skill. While finding new problems, new possibilities and looking at old problems from a new perspective require creative imagination, which marks the real progress of science. (Einstein & Infeld, 1966, p. 67)

In the view of the quasi-Popper concept of knowledge, Einstein was emphasizing knowledge such as "answer logic". Moreover, by trial and error, scientists create two basic types of knowledge: the logic of asking-answering (A&Q) logic and answering-asking (Q&A logic).

As a scientist promoting human progress, the daily work of research is actually very simple in form, that is, to create and test the above two types of knowledge, but it is based on advanced disciplinary knowledge and creates a large number of false assumptions every day. Of course, scientists can either do scientific research alone without the participation of others, or they can share their thought and findings with others, allowing colleagues and students to criticize and find errors, so as to stimulate the thinking of the team—this is a process of "sharing errors". In this case, the formers are typically "teaching and explaining" teachers, who teach their students the truth, propagate the doctrine, impart professional knowledge, and resolve doubts. Although this kind of teachers also makes mistakes, they usually pass on the truth to students and ensure the excellence of the individual. The latter are "errors-sharing" teachers who drive the development of the whole team (Zhou & Lin, 2010). Moreover, in the history of western science, there are two different geniuses: Josiah Willard Gibbs of Yale University, who exemplified the "teaching and explaining type", and Niels Bohr, founder of the Copenhagen School, who exemplified the "sharing of errors". "The glory of the university should rest upon the character of the teachers and scholars and not upon their numbers of buildings constructed for their use" (Huang & Liu, 1993, p. 10). However, the existence of masters only temporarily maintains the leading position in the discipline and is not necessarily sustainable. As the only master of theoretical physics in American universities at the end of the 19th century, Gibbs's students made no achievements in theoretical physics, while Bohr's students led the development of the frontier of quantum theory. The Institute of Theoretical Physics of the University of Copenhagen once became a pilgrimage to quantum theory. The decline of a subject is not determined by the development logic of knowledge itself, not by one's individual ability.

Gibbs was the greatest American theoretical physicist of the second half of the 19th century, even a giant of theoretical physics, with no errors found in his articles so far. Gibbs got his doctorate in applied science and engineering from Yale in 1863 and spent the next three years as a Yale teacher. In 1866, at the age of 27, Gibbs studied abroad and returned in 1969. After two years of independent study and research, he was appointed an unpaid professor of theoretical physics at Yale University in 1871. Nearly a decade later, he made important achievements recognized by the great physicist James Clerk Maxwell. But it was until May 1879, when Gibbs received an invitation from Daniel Coit Gilman, president of Hopkins, that Yale recognized his value and then intervened to retain him, and considered paying him a salary for the first time (Kevles, 1978, pp. 32-34). More surprisingly, Gibbs was the greatest theoretical physicist of the late 19th century in the United States, whose students were all experimental physicists. The reasons for their success were not only the lack of attention from Yale's president and administrators, but also Gibbs's own personality.

Gibbs was a brilliant thinker, but he was scanty of words and unsociable.

> He never bothered to publicize his own work; He was content to solve the problems that exist in his mind, and after one problem was solved, he went on to think about another problem, never wondering whether others understood what he had done. In addition, his articles were difficult to understand and he seldom cited examples to help illustrate his arguments. The implications of his laws are often left to the reader. (Zhao & Xiao, 1985, pp. 466-467)

In terms of cultivating students, Gibbs, who lived a solitary life, brought only a few graduate students. However, Gibbs never invited students to participate in his research, and the academic work he presented to them was "finished" rather than "half-finished" (Wheeler & Gibbs, 1962, pp. 46-106). Therefore, none of his student understood his process of thought, how he tried and failed, what wrong assumptions he drew inspiration from. Without this kind of "talent", even with the physics giant Gibbs, Yale could not cultivate first-class theoretical physicists, let alone form the center of theoretical physics, even if it had Gibbs, the physics giant. Gibbs apparently failed to recognize that it was a very important responsibility of a tutor for students to grasp as much as possible the false assumptions that exist at the cutting-edge of the subject. Or, how students master enough world-class false assumptions has become a prerequisite for their ability to contribute to this field.

Gibbs was also unsociable in his unwillingness to engage with his peers. The first meeting of the American Physical Society was held in New York on May 20, 1899. Of the 38 participants, 36 were from American universities (Merritt, 1934, pp. 143-148). Gibbs, a loner who has a habit of distancing himself from organizations, declined to participate (Merritt, 1934, pp. 143-148; Bedell, 1949, pp. 1601-1604). After Gibbs' death in 1903, the development of theoretical physics in American universities was even worse because he did not leave behind a creative theoretical group. At the beginning of the 20th century, however, theoretical physics was quietly at the center of the development of the discipline. Looking back on the development of 19 century American physical discipline and the early 20th century American university for the lack of first-class theoretical physicist and physics center, we might imagine that if Gibbs was more gregarious and willing to "share errors" with students and colleagues, theoretical physics may have taken root in American universities at the end of the 19th century.

In contrast with Gibbs' personality, Niels Bohr, the Danish physicist and leader of the "Copenhagen Spirit", founded the Institute of Theoretical Physics in 1921 at the University of Copenhagen in Denmark, which soon became the birthplace of quantum theory research and the training ground for young physicists. It was said that 63 scholars from 17 countries worked at the Bohr Institute for more than a month in the 1920s, and 10 of them won the Nobel Prize successively (Wheaton, 1981, pp. 157-159). The reason why so many young scientists in this institute won the Nobel Prize was closely related to the unique "Copenhagen spirit" of the Institute. The physicist Leon Rosenfeld, who once worked as Bohr's assistant, described the Copenhagen spirit as "the most remarkable spirit of complete freedom of judgment and discussion" (Rosenfeld, Stachel, & Cohen, 1979, pp. 88-89).

The Copenhagen spirit clearly demonstrates the sharp contrast, that is, how to make a collective inspire and motivate each other in discussing issues, so that the collective is far better than a simple sum of not contacting others (Gong, 2009). However, if the "Copenhagen spirit" is understood as "a strong academic atmosphere of equality, free discussion and close cooperation"; Or, "a mixture of high intellectual activity, daring adventure, abstruse inquiry, and jovial optimism"; Or, "The Copenhagen spirit is an expression of Bohr's thought, with its unsurpassed imagination, its great flexibility, its complete intellectual appreciation, and its ability to grasp with unparalleled rapidity the key and value of any new idea" (Yang, 2002, pp. 224-225). This paper argues that such expression fails to discover the first driving force of the Copenhagen spirit, which means that Bohr, as a school leader, besides his excellent intelligence, was willing to "share errors" with his colleagues and students, or, in other words, he was used to "thinking aloud".

In his style of research, Bohr spent most of his life learning new science through discussion with others, and reading came the second (Blaedel, 1988, p. 159). Neville Mott, one of Bohr's students, was impressed by Bohr's approach to physics: "When Bohr had a new idea, he went to the institute and told the first person he could find.... Almost half of the team's were discussing" (Blaedel, 1988, p. 513). There is a small story that illustrates Bohr's ability to "share errors" and to own up to them. Bohr once tried to convince two young men of one of his views. After a long discussion he failed, and then he talked to them separately. When this did not work, he asked them in frustration, "Don't you agree with me at all?" After some time, he came back to tell them that he was wrong (Blaedel, 1988, p. 69). Similarly, when Bohr was writing academic papers, he would say, "Let's try to see what we know and put it out as best we can." Then, the first draft was drawn up and immediately criticized, with countless refinements and corrections covering the page. Consequently, all of a sudden, this whole article that he'd worked so hard to get is going to be scrapped. A second text was elaborated, embodying perhaps some remnants of the first, and was immediately subjected to the same criticism, ruthlessly destructive of any obscurity or looseness of thought (Rosenfeld et al., 1979, p. 314). Unlike Gibbs, who covered up the whole process, Bohr's process was shared with the researchers. In fact, being honest about his errors became a natural part of Bohr's personality, and he stuck to it even as he attained master status. Even when he has achieved master status, he has always adhered to this style.

However, Bohr clearly knew that by opening up his thought process too much, his peers would find his false assumptions not always instructive. On his last visit to the Soviet Union in May 1961, after giving a talk at a symposium, Bohr was asked why he was able to surround himself with so many young physicists of creative talent. Bohr replied, "Probably I have never been ashamed to admit to my students that I am a fool" (Editor of Journal of Dialectics of Nature, 1980). From this, we can see that teachers who'd like to share their precious errors do need courage. Another example is Edward Teller, the father of American hydrogen bombs. He raised at least ten problems every day when he entered the laboratory at first, among which eight or nine ones were wrong. However, his greatest works were just in those one or two important problems (Yang, 2008). At the same time, students were also inspired and educated in the process of refuting Taylor's false assumptions. In general, in the history of science, most scientific masters were willing to admit errors. For example, Theodore Von Kármán, a mentor of Qian Xuesen, once admitted his errors, but few scientists like Bohr and Taylor were keen on opening up their thought process and drawing inspiration from their feedback.

Conclusions

According to the classic case analysis of Gibbs and Bohr, it can be seen that modern universities can only be temporarily in the world's first-class universities when they inherit the tradition of academic freedom and academic autonomy in the middle ages, undertaking the functions of teaching, scientific research, and service, and having masters, excellent students, and sufficient funds for scientific research. In order to maintain the world-class status for a long time, the new idea of university must promote the spirit of "sharing errors" among its academic leaders. The quality and quantity of false assumptions put forward by the leaders of the discipline determine the current level of development of the discipline. Whether the leader is interested in sharing his errors with students and colleagues determines the future development prospect of university disciplines. When the leaders close their thinking and are unwilling to open to colleagues and students before the results come out, they will lose a very important learning opportunity, they will lose the opportunity to be criticized. Without such interactive communication, the growth of the whole team will be rather slow.

Sharing Errors & Trial and Error

According to Collingwood's theory, knowledge can be regarded as a process of "…P1—TT—EE—P2…". While the formation of the former part P1 requires a series of trial and error hypotheses, within which the problems in P1 can be thought as a true problem. In terms of methodology, the university idea of "sharing errors" is consistent with the basic scientific method of "trial and error". In terms of the evaluation system, some professors obtain professor titles because they put forward wrong but novel assumptions, and the most typical one is the history of quantum theory. Since the old quantum theory was put forward by Niels Bohr in 1913 to the construction of quantum mechanics by the end of 1925, physicists have been exploring for more than ten years and gone through many detours. However, many physicists have become important figures in quantum theory because of their wrong quantum papers, and none of them have been deprived of their professorship for publishing articles that are ultimately proved to be wrong, because science itself is to see who can come up with more innovative but possibly wrong hypotheses, not necessarily the ultimate truth. As Hideki Yukawa, a Nobel Prize laureate in physics, said:

> When we look back at the history of theoretical physics, we go so far as to call it a history of errors. Most of the theories that many scientists have come up with are wrong and therefore do not survive. Only a few correct theories survive. Considering these existing theories simply will give people an impression of continuous progress. The consideration of these existing theories gives the impression of continuous progress, but without a few successes followed by many failures, there can hardly be any progress in knowledge. (Yukawa, 1973, pp. 54-55)

It can be seen that the ability to participate in the creation of wrong assumptions and publish a series of corresponding achievements is the embodiment of scientific ability, which requires the adjustment of scientific policies. That is, research management must recognize that scientific research is a process of trial and error, and require researchers to sincerely share their errors with their peers instead of allowing the subject research to fail. It is not because of the fear that the failure of this research will affect the next application, and then tamper with the data to make a seemingly successful research.

From the perspective of the new idea of university "sharing errors", Niels Bohr put it into practice in an almost perfect way, thus creating the world famous Copenhagen School. As far as the current educational practice of Chinese universities and primary and secondary schools is concerned, the establishment of teacher authority is based on the fact that teachers are the embodiment of truth, but it is not realized that putting forward new and wrong assumptions itself is also a kind of innovation. In the process of building a world-class university in the 21st century, China needs to implement the new idea of "sharing errors", that is, academic leaders have to complete the transformation from traditional teachers who "preach, teach and solve problems" to the ones who'd like to "share errors" (Zhou & Lin, 2010).

Gross Problem Product (GPP)

Through the theoretical analysis, we can see that the sprit of "sharing errors" is throughout the whole process of "…P1—TT—EE—P2…". Only by the continuous Tentative Theory (TT) and Error Elimination (EE) can we find the bridge between P1 and P2, which is defined as a critical process of trial and error. From this perspective, the essence of sharing errors is to enable students to get fully involved in putting forward reasonable trial and error assumptions and hypothesis. In fact, giving rise to problems can also be included in the course of sharing errors. The critical development of each discipline largely depends on the problems put forward by the academic leader, or, in other words, the "Gross Problem Product" (GPP). Gross Problem Product (GPP) is the total problems produced within each discipline in a specific time period. As a broad measure of overall production, it functions as a comprehensive scorecard of the subject development, which has a direct impact on the future of a university. However, the premise of GPP is that the problems must be endurable and meaningful, the value and quality of which can only be tested through TT and EE. In this way, the practice of trial and error can follow, which requires academic leaders to share their errors through the whole process of "…P1—TT—EE—P2…" so that students are able to realize how the leaders overcome the heavy fog of many wrong assumptions in the end. The spirit of sharing errors is not only identified with the interaction between Problem and Errors, but also gathering the team's wisdom effectively, which contributes to the increase of GPP. That is to say, the density and quality of GPP is closely related to the development of each discipline, while the development of each subject will affect the formation of word-class university. Brilliant as he was, Gibbs was such a man of few words that he was unable to promote the GPP of his academic team by sharing errors. In sharp contrast, Boer increased the GPP to a great extent by sharing errors and hypothesis with his team, which we now call them the Copenhagen School. From the two cases, we can see that it is the leading GPP that decides the production of hypothesis and the practice of trial and error. Actually, Gross Problem Product requires the academic leaders to share their errors in order to promote the impart of knowledge. As we all know, the university is composed of different disciplines and acts as an essential role in spreading knowledge. For world-class university, the GPP in each discipline in total is indispensable to the growth and academic excellence of a university. It is the real and valuable problems that inspire reasonable practice of trial and error, which eventually becomes the motivation and the source of academic innovation.

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