

The Application of Instant Evaluation Based on Information Technology in Anatomy Teaching from China

Aplicación de Evaluación Instantánea Basada en Tecnología de la Información en la Enseñanza de la Anatomía en China

Shu-liang Niu^{1,3}; Ying Liang²; AbuduJLL Abuduklm³; Yuan-yuan Jin³ & Jie Yan^{1,3}

NIU, S. L.; LIANG, Y.; ABUDUKLM, A.; JIN, Y. Y. & YAN, Y. The application of instant evaluation based on information technology in anatomy teaching from China. *Int. J. Morphol.*, 40(4):867-871, 2022.

SUMMARY: The information technology (IT) based "instant evaluation" is supported by IT, which allows instant evaluation of teaching phenomena based on certain evaluation criteria and provides instant feedback. In anatomy teaching, we explored and practiced the application of instant evaluation based on a platform called "Rain classroom." We found that IT-based instant evaluation had higher practicability and better student satisfaction, which could improve teaching efficiency during class time, help students improve learning methods, and promote knowledge mastery. Additionally, instant evaluation positively impacted teachers' evaluation ability and teaching skills.

KEY WORDS: Instant evaluation; Information technology; Rain classroom; Two-way feedback; Anatomy teaching.

INTRODUCTION

Learning evaluation is a measure to determine, analyze, and evaluate the learning process and results. It has the functions of diagnosis, feedback, and teaching improvement, and is an important part of teaching activities. The methods of learning evaluation mainly include summative and formative evaluation. Compared with the former, formative evaluation can assess students' learning process more realistically and comprehensively, and obtain feedback and improvement. It is student-centered to ensure the learning effect of each lesson, and to help assess, teach, improve, and promote development collaboratively. Therefore, formative evaluation that is based on a continuous observation, recording, and reflection of the whole learning process is more conducive to students' development (Li *et al.*, 2020). As one of the evaluation methods of formative assessment, immediate assessment is a way for teachers to instantly evaluate and provide feedback on students' learning attitudes, methods, and effects in the classroom (Tsamis *et al.*, 2018), which can play a more timely monitoring and guiding role.

The formative evaluation system for systematic anatomy is mainly focused on four dimensions: in-class behavior, short-term assessment, section examination, and long-term examination (Fig. 1). Historically, in-class instant evaluation mainly involved teachers' evaluation and feedback to some or even a few students through classroom questioning and observation (Mahon *et al.*, 2018). It was low in efficiency and difficult to use to achieve full coverage of evaluation, resulting in low fairness, objectivity, and universality of evaluation.

The rapid development of information technology (IT) has brought new ideas, impetus, and directions to education and teaching. The application of IT to classroom teaching makes teaching evaluation more convenient and supports personalized evaluation. IT-based "instant evaluation" is an instant assessment of teaching phenomena based on certain evaluation criteria, with the support of IT and instant feedback. In anatomy teaching, we use "Rain Classroom" software to conduct instant evaluation, which

¹ School of Basic Medical Science, Central South University, Changsha, Hunan P.R. China.

² Department of Nutrition and Food Hygiene, School of Public Health Xinjiang Medical University, Urumqi, China.

³ Department of Anatomy, Basic Medical College, Xinjiang Medical University, Urumqi, China.

FUNDING. This work supported by Educational reform research project of Xinjiang Medical University, Postgraduate education and teaching reform project of Central South University (2021YJSKSA24), Course education project of Central South University (2021KCSZ077), Project of postgraduate teaching case database of Central South University (2022ALK038).

not only makes evaluation convenient, timely, fair, objective, and universal, but also improves students' classroom satisfaction and teaching effectiveness.

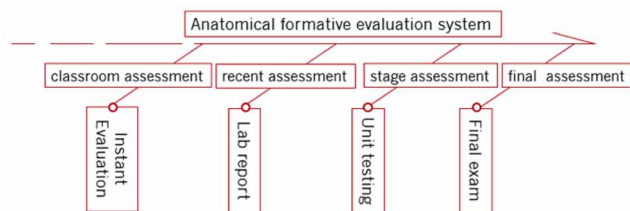


Fig. 1. Diagram of anatomy formative evaluation system.

MATERIAL AND METHOD

Teaching software preparation: "Rain Classroom" is a free, intelligent teaching software jointly developed by Tsinghua University Online Education Office and Xuetang Online, and integrates complex IT tools into PowerPoint and WeChat. Teachers need to follow Rain Classroom's official account on WeChat and create a class unit; the created class will then establish a QR code, which students can scan to enter the class. The students can then access online real-time lectures, slide shows, exams, and other functions. During a lecture, teachers can instantly send random quizzes to students, while students can receive random questions from teachers and answer them in real time through their personal mobile devices. Rain Classroom provides an ideal solution for instant evaluation.

The content design of learning evaluation: The content and form of evaluation directly affect the feedback effect of classroom teaching evaluation. The content of an instant review should be a well-designed quiz. Test questions are set with attention on two aspects: First, the questions should be designed according to the teaching objectives, combined with the knowledge, ability, and attitude that students need to master. Second, they should be combined with practical application situations, develop students' professional thinking skills, and be able to deeply stimulate students' interest and promote knowledge transfer. The final test questions for learning assessment are composed based on an analysis of the teaching objectives, teaching content, and teaching context.

For example, in the teaching of the shoulder joint, the knowledge objective is to master its composition and characteristics, while the ability objective is to analyze the anatomical mechanism and the direction of clinical treatment of common clinical diseases (such as shoulder dislocation) in conjunction with the characteristics of the shoulder joint. Therefore, the immediate evaluation test question was set

as follows (Fig. 2): A patient, male, 23 years old; when the upper limb is abducted and externally rotated during a fall, the brace or elbow lands on the ground, the external force impacts along the longitudinal axis of the humerus, and the head of the humerus tears off the joint from the weak part between the subscapularis and the greater trochanter and dislocates forward and downward. Which is most likely to form a dislocation of the shoulder joint? The open-ended question was the following: What is the direction of clinical treatment for this dislocation and what should be noted from an anatomical point of view (Fig. 2).

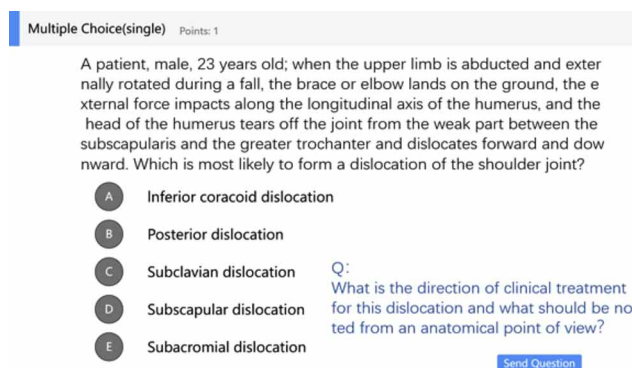


Fig. 2. «Rain classroom» test diagram.

Classroom implementation of learning evaluation: As attention is the basis of learning and memory, when in a state of concentration, the content of consciousness is clearer, and there will be a deeper understanding of the inner mechanism of the learned knowledge, which will help further processing of the learned content. Studies show that college students' concentration time is approximately 15–20 minutes (Zhao *et al.*, 2014). Therefore, the frequency of learning evaluation is set to 15–20 minutes, with 2–3 time cells in total for each class. The specific release time for the learning assessment test questions should be combined with the classroom teaching content, which is typically released immediately after the key concepts and knowledge needed to solve the problem, which helps students to grasp the core content. The response time for learning assessment questions can be too long or too short, which can affect the authenticity of the assessment results. Therefore, when the objective questions are released in Rain Classroom, the answer time is typically set to 1 minute, which may also be adjusted according to students' specific answers in practice. According to Rain Classroom's summary data, teachers can conduct on-site evaluation and feedback on the spot, which can identify problems and improve shortcomings in a timely manner, as well as promote a harmonious relationship between teachers and students and optimize classroom teaching effects.

For example, the teaching process for "urinary system" (1 class hour, 50 minutes) entails approximately 20 minutes of teaching time for the kidney, 8 minutes for the ureter, 12 minutes for the bladder, 5 minutes for the urethra, and a unit introduction and a 5-minute class summary. The learning assessment questions were set during the kidney (15–20 minutes after class) and bladder (approximately 40 minutes after class) parts in the teaching sessions.

Feedback from instant reviews: The quality of feedback is an important factor in students' learning. Timely feedback is a key step for timely evaluation to motivate, regulate, and guide.

Feedback mainly comprises encouragement and takes the form of guidance to remind students to pay attention to existing problems. Oral feedback is adopted in class to allow face-to-face comments on overall performance and common problems. Oral feedback is more convenient, personalized, and targeted than the frequently used written feedback. In the process of providing oral feedback (Huang *et al.*, 2020), teachers need to seize the opportunity to dialogue and interact with students, listen to their aspirations, keep the trend of their thoughts, discover their characteristics, provide positive feedback and improvement suggestions (Gao & Song, 2021), and encourage them to actively find and correct deficiencies in learning (Liu & Wang, 2018). In practice, positive feedback is superior to negative feedback.

To avoid discouraging the learning enthusiasm of "early warning" students, learning enthusiasm, the protection of students' privacy is of great priority during feedback. "Early warning" students refer to students who achieve lower scores or take more time to finish given tasks, based on an analysis from Rain Class. Rain class can provide detailed data analysis (Fig. 3) on students' answers to questions, which allows comparative feedback to improve students' constructive perception. Teachers can make full use of these data and provide individual feedback to the "early warning" students after class. The feedback mainly includes affirming outstanding performance, pointing out existing problems, analyzing causes, and proposing pertinent suggestions. Thus, teachers can help the "early warning" students build confidence and find and correct their shortcomings in learning.

RESULTS

To understand the practicability of real-time evaluation and students' degree of satisfaction with it, we conducted a sample questionnaire survey among 288 students in Xinjiang Medical University. The students majored in clinical medicine, imaging, and traditional Chinese medicine from 2018 to 2021. The results show that 79.86 % of these students fully agree that real-time evaluation improves their learning attitude; 75.34 % of them fully agree that real-time evaluation improves their learning method. More than 80 % of the students fully agree that real-time evaluation improves their learning enthusiasm, promotes their knowledge mastery, contributes to their long-term development and communication between teachers and students, and improves learning ability. Of the students, 99.30 % fully agree that feedback is timely, while 88.19 % of them disagree that feedback is not helpful. It is worth noting that only 55.20 % of the students fully agree that the feedback opinions are true, while 11.80 % of them disagree with the feedback opinions (Table I). It is suggested that more attention be paid to observation and listening, putting oneself in students' shoes, and providing objective evaluation to students sincerely and in a friendly manner, to improve students' recognition of feedback and improve the practicality and recognition of immediate evaluation.

In the overall observation of the instant evaluation results of the class, we find that the students' scores show an obvious upward trend (Fig. 4), with the average score rising from 7.25 points (on a 10-point scale) to 9.34 points, which may be related to the fact that instant evaluation enhances students' attention to class and improves their learning habits and methods. We note that, in the vascular learn 1 (teaching content for the heart) and nervous system 1 (teaching content for the spinal cord and brain stem of teaching), students' average grades present obvious drops. From a later review of the teaching process, we think the main reason is that the above teaching content is relatively difficult to understand. Thus, the subsequent teaching process should devote more time to these two parts and optimize the teaching design further.

Fig. 3. Tips for outstanding students and early warning students.



Table I. Survey results of students' satisfaction with instant evaluation.

Evaluation	student numbers n (%)			
	Full agreement	Agree	Disagree	Unclear
Correct the learning attitude	230 (79.86)	44 (15.27)	6 (2.08)	8 (2.77)
Improve learning methods	217 (75.34)	58 (20.13)	9 (3.12)	4 (1.38)
Improve the enthusiasm of learning	235 (81.59)	50 (17.36)	3 (1.04)	0 (0.00)
Promote knowledge mastery	261 (90.62)	21 (7.29)	2 (0.69)	4 (1.38)
Contribute to long-term development	235 (81.59)	37 (12.85)	0 (0.00)	16 (5.55)
Timely Feedback	286 (99.30)	0 (0.00)	0 (0.00)	2 (0.69)
Facilitate communication between teachers and students	247 (85.76)	19 (6.60)	0 (0.00)	22 (7.64)
Reliable feedback	159 (55.20)	92 (31.94)	34 (11.80)	3 (1.04)
Help to improve learning ability	221 (85.76)	41 (14.24)	0 (0.00)	26 (9.04)
Feedback doesn't help me much	25 (8.68)	7 (2.43)	254 (88.19)	2 (0.69)

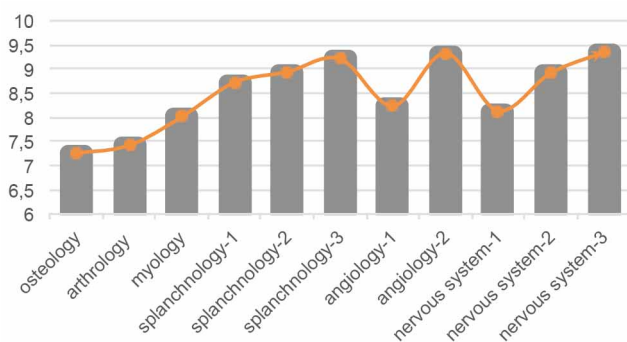


Fig. 4. The changing trend of class average scores.

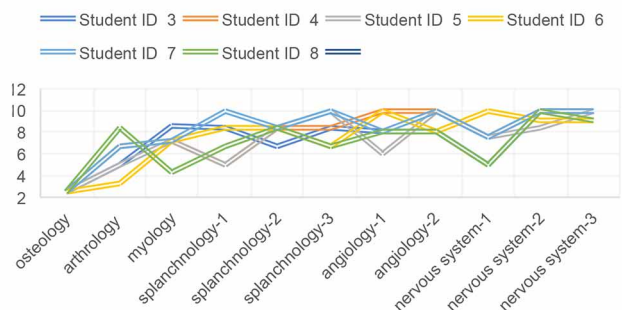


Fig. 5. The trend of early warning student's mark.

We conducted instant feedback for a semester on the 8 "early warning" students with the lowest scores in the class in the first instant evaluation (2.5/10). Their scores showed an upward trend, with 25 students (88 students in total) obtaining full marks (Fig. 5), where the full marks mainly appeared in the middle and late periods. Interestingly, consistent with the upward trend in the average score for the instant assessment, four students' scores showed a decline in angiology while six students achieved lower scores in the teaching of nervous system-1. Subsequently, we conducted individual interviews with these students, whose feedback showed that the contents of heart and nervous system were abstract and not easy to understand. Through

students' feedback, teachers were reminded of the need to improve the teaching methods of these contents. Immediate evaluation plays a positive role in improving teachers' evaluation ability and teaching skills.

DISCUSSION

The significance of immediate evaluation is to provide students with immediate feedback. High quality feedback is a crucial factor in students' learning (Gao & Song, 2021). The content of the real-time evaluation is carefully designed and closely linked to the courses, which avoids judging the results simply by right or wrong. The real-time evaluation approach reflects both immediacy and accuracy; thus, students can achieve a sense of participation in class and participate more in class discussions.

With the continuous enhancement of informatization, the feedback approach is also diversifying. Students' responses follow a certain tendency (Liu & Wang, 2018). Students have different preferences for teachers' feedback, which can affect their learning. They prefer audio feedback to written feedback because the former is convenient and personalized (Scoles *et al.*, 2013). Most students expect teachers to provide more oral feedback, which can promote the development of self-regulation and allow more opportunities for dialogue and interaction with teachers.

Emotion is an important educational resource that cannot be ignored in education. Teaching is not only a process of knowledge interchange between teachers and students, but is also a process of deepening their emotions. Effective instant teaching evaluations can stimulate students' enthusiasm well for participating in the classroom and improve their interest in learning. Evaluation language has a comprehensive impact on students' learning visions,

emotional attitudes, and values (Steen-Utheim & Hopfenbeck, 2019). This may be one of the reasons that students show higher recognition on instant evaluation.

Effective feedback can develop students' self-evaluation skills, enable them to feel capable and confident to find and correct their deficiencies in learning (Bird & Yucel, 2015). However, online teaching should promote the use of IT from the perspective of teaching theory, focusing not on efficiency but on pioneering a new path of learning.

The core of learning evaluation is to improve teaching and learning through two-way feedback (Dong *et al.*, 2021). Through immediate evaluation, teachers can clarify the degree to which students master and understand knowledge during teaching, and provide direction for the next step of schooling. Teachers use evaluation language to provide immediate feedback to students, which maintains students' thinking on the thread and specifies the key points of the course; thus, it advances the whole class in the established direction and achieves the purpose of promoting learning and development by this evaluation. Ultimately, evaluation language is used to attain a collaborative development of teachers and students.

CONCLUSION

The real-time teaching evaluation that is based on IT shows better convenience, timeliness, fairness, objectivity, and universality than the traditional one, with higher student satisfaction and recognition. The results for both the whole class and "early warning" students showed an upward trend in the classes that applied real-time teaching evaluation. It is inferred that the method helps to trigger students' interest and to improve teaching efficiency. Teachers establish the critical points and difficulties through this evaluation, and thus enhance teaching quality. The real-time evaluation that is based on IT contributes to the realization of the virtuous circle of "teaching-learning-evaluating" and effectively promotes students' core literacy and the common development of teachers and students.

NIU, S. L.; LIANG, Y.; ABUDUKLM, A.; JIN, Y. Y. & YAN, Y. Aplicación de evaluación instantánea basada en tecnología de la información en la enseñanza de la anatomía en China. *Int. J. Morphol.*, 40(4):867-871, 2022.

RESUMEN: La "evaluación instantánea" basada en la tecnología de la información (TI) está respaldada por ésta y permite la evaluación instantánea de los fenómenos de enseñanza en función de ciertos criterios de evaluación proporcionando retroalimentación

instantánea. En la enseñanza de la anatomía, exploramos y practicamos la aplicación de la evaluación instantánea basada en una plataforma llamada "Aula de lluvia" o Rain Classroom. Descubrimos que la evaluación instantánea basada en TI tenía una mayor practicidad y una mejor satisfacción de los estudiantes, lo que podría mejorar la eficiencia de la enseñanza durante el tiempo de clase, ayudar a los estudiantes a mejorar los métodos de aprendizaje y promover el dominio del conocimiento. Además, la evaluación instantánea tuvo un impacto positivo en la capacidad de evaluación y las habilidades de enseñanza de los maestros.

PALABRAS CLAVE: Evaluación instantánea; Tecnología de la información Aula de lluvia; Retroalimentación bidireccional; Enseñanza de la anatomía.

REFERENCES

- Bird, F. L. & Yucel, R. Feedback codes and action plans: building the capacity of first-year students to apply feedback to a scientific report [J]. *Assess. Eval. High. Educ.*, 40(4):508-27, 2015.
- Dong, Y.; Li, X.; Zheng, Y. & Zhai, X. Research on human-machine two-way feedback mechanism oriented to intelligent education applications. *Open Educ. Res.*, 27(2):26-33, 2021.
- Gao, X. & Song, N. Analysis of value-added evaluation promoting the high-quality development of basic education in China. *J. Jiangxi Norm. Univ. Philos. Soc. Sci.*, 54(6):100-6, 2021.
- Huang, C.; Chan, Y. W. & Yen, N. *Data Processing Techniques and Applications for Cyber-Physical Systems (DPTA 2019)*. Singapore, Springer, 2020.
- Li, L.; Cong, X. & Wu, L. L. Application and enlightenment of formative assessment in the innovation and development of higher education in basic medical science. *Sheng Li Xue Bao*, 72(6):743-50, 2020.
- Liu, L. & Wang, C. On the status quo and countermeasures of supervision and evaluation of higher education. *Heilongjiang Anim. Husb. Vet. Med.*, (22):244-6, 2018.
- Mahon, P.; Lyng, C.; Crotty, Y. & Farren, M. Transforming classroom questioning using emerging technology. *Br. J. Nurs.*, 27(7):389-94, 2018.
- Scoles, J.; Huxham, M. & McArthur, J. No longer exempt from good practice: using exemplars to close the feedback gap for exams. *Assess. Eval. High. Educ.*, 38(6):631-45, 2013.
- Steen-Utheim, A. & Hopfenbeck, T. N. To do or not to do with feedback. A study of undergraduate students' engagement and use of feedback within a portfolio assessment design. *Assess. Eval. High. Educ.*, 44(1):80-96, 2019.
- Tsamis, G.; Papadakis, N.; Tzirakis, E.; Rousaki, M.; Katsaraki, E.; Nikolopoulos, J.; Panteri, E. & Vassilakis, K. Instant evaluation of teaching methods and students' comprehension level using smart mobile technology. *EAI Endorsed Trans. Creat. Technol.*, 5(16):156384, 2018.
- Zhao, Y.; Jiang, Y.; Lou, W.; Yu, X.; Zhang, L. & Han, L. The influence of different genders on college students' attention concentration. *J. Hebei United Univ. Soc. Sci. Ed.*, 14(4):5-7, 2014.

Corresponding author:

Dr. Jie Yan
Department of Forensic Science
School of Basic Medical Science
Central South University
Changsha
Hunan - CHINA

E-mail: wills212156@csu.edu.cn