香港城市大學
City University of Hong Kong

Discovery-based learning in nucleic acid research using innovative and interactive teaching methodology

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Principal Investigator: Dr. Chun Kit KWOK

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Abstract:

In this project, I will implement discovery-based learning in nucleic acid research using innovative and interactive teaching methodology, which will greatly enhance the teaching and learning experience of the course BCH3081 Chemical Biology of DNA and RNA that is being offered every year to ~40 undergraduate students. This teaching idea is original, and can be applied to other courses as well, making this broadly applicable. This teaching initiative will first allow the students to have first-hand experience to learn and interact with the state-of-the-art RNA/DNA online game Eterna, to better understand the properties, folding rules and design of nucleic acid structure motifs, and be able to test their own designs and discover new findings in a non-traditional report format. In addition, interactive discussion will be established to encourage the students to explore and support with evidence their selected candidate for the next Nobel Prize winner. This exercise can enable the students to link between teaching/learning with up-to-date scientific research and literature, and uncover deeply about the latest research data and findings of their proposed candidate, and present it in front of the class to justify why their nominated candidate deserve a Nobel Prize. These 2 activities are creative and will be able to foster student's curiosity and discovery sense in science.

Academic Publication:

Mou, X., Liew, S. W., & Kwok, C. K. (2022). Identification and targeting of G-quadruplex structures in MALAT1 long non-coding RNA. Nucleic Acids Research, 50(1), 397–410. https://doi.org/10.1093/nar/gkab1208

Chen, X., Yuan, J., Xue, G., Campanario, S., Wang, D., Wang, W., Mou, X., Liew, S. W., Umar, M. I., Isern, J., Zhao, Y., He, L., Li, Y., Mann, C. J., Yu, X., Wang, L., Perdiguero, E., Chen, W., Xue, Y., … Wang, H. (2021). Translational control by DHX36 binding to 5'UTR G-quadruplex is essential for muscle stem-cell regenerative functions. Nature Communications, 12(1), 5043. https://doi.org/10.1038/s41467-021-25170-w

Dumetz, F., Chow, E. Y. C., Harris, L. M., Liew, S. W., Jensen, A., Umar, M. I., Chung, B., Chan, T. F., Merrick, C. J., & Kwok, C. K. (2021). G-quadruplex RNA motifs influence gene expression in the malaria parasite plasmodium falciparum. Nucleic Acids Research, 49(21), 12486–12501. https://doi.org/10.1093/nar/gkab1095

Ji, D., Lyu, K., Zhao, H., & Kwok, C. K. (2021). Circular L-RNA aptamer promotes target recognition and controls gene activity. Nucleic Acids Research, 49(13), 7280–7291. https://doi.org/10.1093/nar/gkab593

Lyu, K., Chow, E. Y. C., Mou, X., Chan, T. F., & Kwok, C. K. (2021). RNA G-quadruplexes (rG4s): Genomics and biological functions. Nucleic Acids Research, 49(10), 5426–5450. https://doi.org/10.1093/nar/gkab187

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Yang, X., Cheema, J., Zhang, Y., Deng, H., Duncan, S., Umar, M. I., Zhao, J., Liu, Q., Cao, X., Kwok, C. K., & Ding, Y. (2020). RNA G-quadruplex structures exist and function in vivo in plants. Genome Biology, 21(1), 226. https://doi.org/10.1186/s13059-020-02142-9