Alternative methods as superior studying methods:

1. Abutarbush Sameeh M., Naylor Jonathan M., Parchoma Gale, D'Eon Marcel, Petrie Lyall & Carruthers Terry. **Evaluation of traditional instruction versus a self-learning computer module in teaching veterinary students how to pass a nasogastric tube in the horse.** Journal of Veterinary Medical Education 2006;33(3):447-54

◇ CD-based studying proved more efficient than live demonstrations.

2. Fawver, A.L., C.E. Branch, L. Trentham, B.T. Robertson & S.D., Beckett. **A comparison of interactive videodisc instruction with live animal laboratories.** American Journal of Physiology 1990;259 (Advances in Physiology Education 4):S11–14

◇ Veterinary students practiced by means of video simulations and live demonstrations.

3. Griffon DJ, Cronin P, Kirby B, Cottrell DF. **Evaluation of a hemostasis model for teaching ovariohysterectomy in veterinary surgery.** Vet Surg 2000;29(4):309-16. Department of Veterinary Clinical Studies, Easter Bush Veterinary Centre and the School of Cognitive Science, The University of Edinburgh, Scotland

◇ Student's surgical skills were tested after practicing on a plastic model imitating the anatomy and hemodynamics of a dog's female genital system.

4. Henman, M.C., & G.D.H. Leach. **An alternative method for pharmacology laboratory class instruction using biovideograph videotape recordings.** British Journal of Pharmacology 1983;80:591P.

◇ Pharmacology students who studied through videos had better test results.

5. Johnson A.L. & J.A. Farmer. **Evaluation of traditional and alternative models in psychomotor laboratories for veterinary surgery.** Journal of Veterinary Medical Education 1989;16(1):11–14.

◇ Alternative models proved better in practicing psychomotor skills since drills could be repeated as many times as needed.

6. Leonard W. H. **A comparison of student performance following instruction by interactive videodisc versus conventional laboratory.** Journal of Research in Science Teaching 1992;29(1):93–102.

◇ CD-based studying takes up less time.

7.More, D. & C.L. Ralph. **A test of effectiveness of courseware in a college biology class.** J. Educational Technology Systems 1992;21:79–84.

◇ Better results were achieved by biology students who used computer methods.

8. Olsen D, Bauer MS, Seim HB, Salman MD. **Evaluation of a hemostasis model for teaching basic surgical skills.** Vet Surg 1996;25(1):49-58. Department of Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, USA.

◇ Veterinary students practiced their surgical skills on an alternative model and a dog. The model proved as efficient as the dog. The students assessed the model as satisfactory.

9. Phelps, J.L., J.O. Nilsestuen & S. Hosemann 1992. **Assessment of effectiveness of videodisc replacement of a live animal physiology laboratory.** Distinguished Papers Monograph, American Association for Respiratory Care.

◇ Students who practiced with the help of an interactive video programme imitating heart contractions had better test results than the ones who practiced on animals.

10. Samsel, R.W., G.A. Schmidt, J.B. Hall, L.D.H. Wood, S.G. Shroff & P.T. Schumacker. **Cardiovascular physiology teaching: computer simulations vs. animal demonstrations.** Advances in Physiology Education 1994;11:S36–46

◇ Medical students assessed computed simulations as better.

Alternative methods as efficient as conventional ones:

11. Bauer, M.S., N. Glickman, L. Glickman, J.P. Toombs & P. Bill. **Evaluation of the effectiveness of a cadaver laboratory during a fourth-year veterinary surgery rotation.** Journal of Veterinary Medical Education 1992;19(2):77–84.

◇ Results of practicing on dead animals (euthanized for medical reasons or died naturally or by accident) are conventional means are equal.

12. Carpenter LG, Piermattei DL, Salman MD, Orton EC, Nelson AW, Smeak DD, Jennings PB Jr, Taylor RA. **A comparison of surgical training with live anesthetized dogs and cadavers.** Vet Surg 1991;20(6):373-8. Department of Clinical Sciences, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, USA.

◇ Replacing live anesthetized dogs with dead ones is acceptable.

13. Paulo José Basso, Lucas Favaretto Tazinafo, Mauro Ferreira Silva, and Maria José Alves Rocha, **An alternative to the use of animals to teach diabetes mellitus,** Adv Physiol Educ. 2014 Sep; 38(3): 235–238. Department of Morphology, Physiology and Basic Pathology, School of Dentistry of Ribeirão Preto, University of São Paulo.

◇ An alternative approach to teaching diabetes was developed by introducing artificial rats and metabolic cages. Students were satisfied with the alternative approach.

14. Cohen, P.S. & M. Block. **Replacement of laboratory animals in an introductory psychology laboratory.** Humane Innovations and Alternatives 1991;5:221–5.

◇ Students who observed pigeons in parks achieved equally successful results as the students who studied conventionally with rats.

15. Dewhurst DG, Hardcastle J, Hardcastle PT, Stuart E. **Comparison of a computer simulation program and a traditional laboratory practical class for teaching the principles of intestinal absorption.** Am J Physiol 1994;267(6 Pt 3):S95-104. Faculty of Health and Social Care, Leeds Metropolitan University, United Kingdom.

◇ Students who studied by using an interactive computer programme acquired the same level of knowledge as those who studied on killed rats, and achieved that with 1/5 expenses.

16. Dewhurst, D.G. & A.S. Meehan. **Evaluation of the use of computer simulations of experiments in teaching undergraduate students.** British J. Pharm. Proc. 1993;Suppl. 108:238.

◇ Students who used computer simulations and those who used traditional exercises in the fields of pharmacology and physiology achieved equally successful results.

17. Downie, R. & J. Meadows. E**xperience with a dissection opt-out scheme in university level biology.** Journal of Biological Education 1995;29(3):187–94.

◇ Biology students who studied on rat models were as successful as those who studied on rats.

18. Greenfield CL, Johnson AL, Schaeffer DJ, Hungerford LL. **Comparison of surgical skills of veterinary students trained using models or live animals.** J Am Vet Med Assoc 1995;206(12):1840-5. Department of Veterinary Clinical Medicine, College of Veterinary Medicine, University of Illinois, Urbana 61801, USA.

◇ Veterinary students studied on dogs and cats or soft tissue and organ models. Their surgical skills were equally good.

19. Hughes IE. **Do computer simulations of laboratory practicals meet learning needs?** Trends in Pharmacological Sciences 2001;22(2):71-4. School of Biomedical Sciences, University of Leeds, LS2 9JT, Leeds, UK.

◇ Skills of students who studied with simulations were significantly more successful than the ones who worked in the "wet lab". However, their results were less successful with respect to matters specifically related to the "wet lab".

20. Leathard, H.L. & D.G. Dewhurst. **Comparison of the cost effectiveness of a computer-assisted learning program with a tutored demonstration to teach intestinal motility to medical students.** ALT-J 1995;3(1):118–25.

◇ No significant differences were found in students with respect to efficiency regarding computer programmes and the laboratory with live animals.

21. Pavletic, M.M., A. Schwartz, J. Berg, & D. Knapp. **An assessment of the outcome of the alternative medical and surgical laboratory program at Tufts University.** JAVMA 1994;205(1):97–100

◇ At the initiative of veterinary students who thought it morally wrong to kill dogs after drills, an alternative programme was developed in which carcass of sick animals donated by their owners were used. The bodies were kept frozen until use.

Years later, the employers of those students were interviewed. No significant difference was found regarding skills.

22. Clarke KA. **The use of microcomputer simulations in undergraduate neurophysiology experiments.** Alternatives to Laboratory Animals 1987;14:134-40.

◇ No relevant difference was found between the results of students who practiced on frogs and those who used computer simulations.

23. White, K.K., L.G. Wheaton & S.A. Greene. **Curriculum change related to live animal use: a fouryear surgical curriculum.** Journal of Veterinary Medical Education 1992;19:6–10.

◇ Veterinary students had the same results when learning surgical methods with different approaches.

Lower educational efficiency of alternative methods

24. Matthews, D. **Comparison of MacPig to fetal pig dissection in college biology.** The American Biology Teacher 1998;60(3):228–9

◇ Biology students achieved much better results studying on dead fetal pigs as opposed to those who studied on a computerized pig.