

研究生能力与心理质量保障体系的统筹建设与实践

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摘要

一流学科的前提是能培养出一流的人才, 而人才则需具备过硬的能力和心理素质。目前研究生质量保障体系多以能力建设为中心, 而忽视或较少的关注心理素质建设, 从而影响了立德树人根本任务的实现。组建以心理素质培养为中心的教育工作室, 实施思政和心理教育功能, 参与学科团队、导师培养研究生的全过程。利用激励与约束机制, 把心理教育工作室、学科团队和导师个体三者间的协作、监督、发展统筹在一起, 可有效保障研究生教育质量的提升。实践表明所提出的保障体系不仅增强了研究生的自信心和自我认同, 而且极大的推动了学科特色团队的建设, 强化了导师履行立德树人的使命担当。

关键词

教育质量, 心理素质, 保障体系, 能力培养

The Overall Construction and Practice of Postgraduate Ability and Psychological Quality Assurance System

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Abstract

The premise of first-class discipline is to cultivate first-class talents, and talents need to have excellent ability and psychological quality. At present, the quality assurance system for postgra-

duates focuses on capacity building, but ignores or pays less attention to the construction of psychological quality, which affects the realization of the basic task of cultivating talents with moral integrity. The education studio that centered on the cultivation of psychological quality should be organized to carry out ideological and psychological education functions and simultaneously participate in the whole process of training postgraduates of discipline teams and supervisors. The improvement of postgraduate education quality can be effectively guaranteed by using incentive and restraint mechanism and integrating the cooperation, supervision and development among psychological education studios, discipline teams and individual supervisors. The practice shows that the proposed guarantee system not only enhances the graduate students' self-confidence and self-identification, but also greatly promotes the construction of the characteristic team of the discipline and strengthens the supervisors' mission to fulfill the moral education.

Keywords

Education Quality, Psychological Health, Guarantee System, Ability Cultivation

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1. 引言

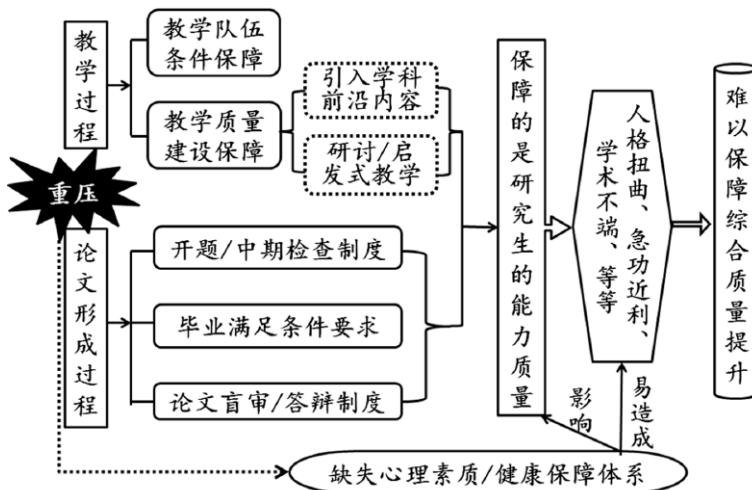
2020 年硕士研究生扩招达 18.9 万, 总招生规模已接近百万, 从而如何保障培养质量不“注水”、学位不“贬值”成为了社会关注的焦点。近年来问题学位论文频出, 要严查严打学术不端行为已成为共识, 研究生培养单位、导师在挤掉研究生学位论文“水分”上的压力持续加大, 所以目前导致研究生质量保障体系多以能力建设为中心, 而忽视或较少的关注在研究生心理素质建设上。正因如此, 由科研活动和主观目标失败诱发研究生走向极端的案例频繁出现, 这种现象随着研究生招生规模扩大必然会更为突出 [1]。研究生能力与心理建设统筹到培养质量保障体系内, 不仅是当前研究生教育培养的迫切需要, 而且是立德树人的根本任务 [2]。

2. 目前研究生教育质量保障体系的现状

保障研究生的教育质量是每一个培养单位需长期坚持的使命, 构建相适应的研究生教育质量保障体系(简称“保障体系”)就成为了完成该使命的“利器” [3], 从目前来看, “利器”基本是布置在“理论教学过程”和“学位论文形成过程”两个阶段(图 1)。

在教学过程中, 目前保障体系主要强调教学师资队伍及其教学质量, 例如要求理论教学的教师队伍为博士、副高以上职称; 教学过程鼓励引学科前沿入课堂和采用研讨式、启发式等教学方法, 要求严把考核评价关。这样的保障体系一定程度上提升了理论教学效果和研究生的学习热情, 但是课堂质量仍很难监控, 仍无法满足研究生内在驱动要求。

在论文形成过程, 目前保障体系主要是对研究生形成压力, 通常设定开题/中期检查环节、加大学位论文盲审力度、严肃答辩过程、对毕业条件提出更高要求(如发表核心/SCI 论文等)等。从执行过程中, 这些保障手段的确给研究生产生了重要影响, 使他们更加重视论文形成过程。但是, 科研过程并不是一帆风顺, 可能会因为研究方向、导师能力及其所能提供的平台条件、研究生的兴趣爱好等问题造成论文形成过程的巨大差异, 使学生背负重大压力, 易于滋生寻求“捷径”、走向“极端”、产生师生“冲突”等现象, 对研究生的心理健康和正确价值观的养成极为不利。

**Figure 1.** Current status of postgraduate education quality assurance system**图 1. 当前研究生教育质量保障体系现状**

以能力为主导的保障体系的确可以为研究生及其导师传导压力,减少“放水”的概率,很大程度上改善了由研究生招生规模扩张带来的教育质量问题。但是,研究生的心理素质或健康已经逐渐转化为影响研究生教育质量的主要矛盾,从我们毕业生调研来看“不快乐科研的体验”正在增加,“科研获得感”的比例正在下降,反映了研究生心理健康正在成为影响其教育质量的内因。

国外名校通常会设立类似心理健康保障的机构,面向研究生心理问题咨询,干预或调解研究生与导师间形成的冲突等问题,而国内研究生培养单位往往缺少这样的功能设置,即使有其所发挥的作用效果也很有限。因此,近年来研究生自杀类事件频发,让国家、培养单位和家庭都蒙受了巨大损失。提升研究生的心理素质与健康,不仅有利于塑造高品质人才的人格,而且有助于促进人才能力质量的飞升^[4]。

3. 统筹能力与心理质量建设的新保障体系

新保障体系是要求能力与心理质量并重,具体策略与方法如图2所示,研究生心理素质建设参与其能力培养全过程。一方面保障研究生心理质量,另一方面发挥党委监督作用,确保导师把立德树人任务落实到位。研究生心理质量出问题往往不能全部归咎于其本身,导师所起作用也非常关键^[5],但是导师(特别是青年导师)缺少相关心理指导训练和经验。因此,新保障体系需要双功能,即要提升研究生的心理素质,也要提升导师培养研究生心理质量的水平。

3.1. 发展导师指导研究生的新模式,降低巨变风险

“一生一师”仍是当前研究生培养过程中的主要模式。一个研究生与一个导师的关系确定后,极少发生调整,所以就形成了社会上常说的“研究生的命运被导师掌握着”,屈从和不平等压迫就有可能发生,从而造成研究生心理健康问题。采用研究生先选择团队后再确认导师的模式,即研究生在科研团队中先与导师接触、沟通并进行课题预研研究,在完成开题报告后再确认导师。通过这种模式不仅可以消除师生间性格不合、研究课题不感兴趣等问题,还能促进团队融合增强学科特色。

3.2. 构建激发研究生内驱动的保障体系,落实能力质量

在培养过程中,研究生发挥主观能动性是提升教育质量的内在驱动力,所以围绕理论教学、学位论文形成过程的各个环节特点制定相应的激励制度。学科专业理论教学推行团队科研方向案例教学,以一

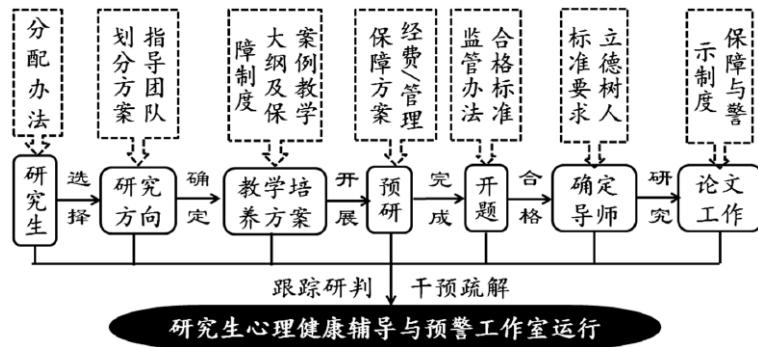


Figure 2. The contents covered by the guarantee system of both competence and psychological quality

图 2. 能力与心理质量双保障体系所涵盖内容

条条方向演化史的方式纵深推进教学内容,为学生呈现科研问题的解决思路和方法,促进研究生的科研思维训练。加强开题/中期检查的作用,建立定期学术交流和公共科研平台服务制度,限制急功近利并严惩学术不端行为,以此保障学位论文形成过程的质量。

3.3. 设立心理质量教育与监控工作室, 独立运行于能力培养全过程

设立研究生心理辅导及预警工作室,工作室成员由院党委书记、心理学专业背景教师和优秀导师代表组成,负责研究生心理咨询、科研活动解惑释疑、调解师生矛盾、心理健康预警等各项事宜。通过学院管理制度保障工作室的运行,形成心理健康干预与能力保障体系有机结合;制定工作室的管理与激励、约束制度,保证工作室在研究生心理干预上发挥实效;评价分析工作室产生的综合效果和对研究生教育质量的贡献关系,检验研究生的科研获得感与幸福感。

4. 新保障体系的实施过程与方法

研究生培养质量是衡量学科建设优劣的要素之一,一流的学科应该培养出一流的人才,所以学科建设应该以人才培养为中心[6]。如图3所示,为了能够让“新保障体系”发挥实效,首先围绕学科特色设置了学科方向,然后每个学科方向再细化出团队方向,并以此成立团队。这样不仅有助于实施团队指导,推进团队方向理论与实践教学,而且学科建设与团队建设紧密结合在了一起。一方面可增强学科特色,另一方面使得团队间教学和科研形成一体,因此新保障体系的实施得到了学科团队导师们的普遍支持。

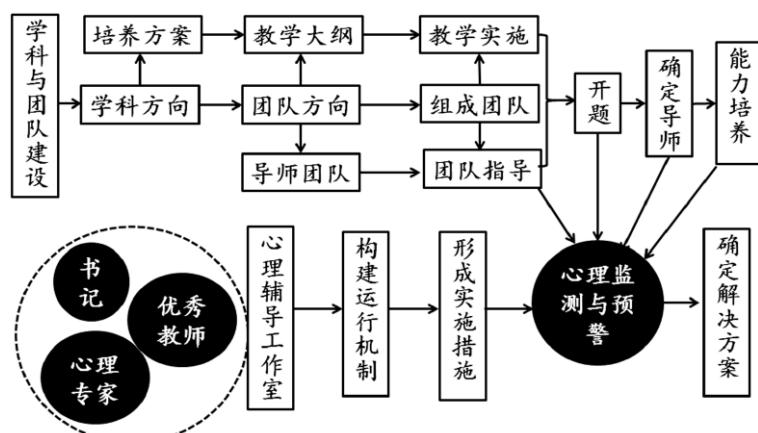


Figure 3. Implementation process of the new guarantee system

图 3. 新保障体系的实施过程

由学院党委书记、心理专家和优秀教师代表组成心理辅导工作室。在学校支持下，该工作室安置在我校柏林旁，所以又称为“柏林树下”工作室。幽静的环境为工作室的运行提供了良好的工作条件。心理辅导工作室运行机制由学院制定学校通过执行，具体包括责任义务、工作内容、惩奖办法和工作方式等。跟踪调研学生心理活动成为常态，同时结合导师日常反馈信息相结合，定期形成总结报告。

研究生入学后，首先由团队负责人介绍团队研究方向内涵、实验室与平台介绍及能力要求等；然后研究生报名并确定研究方向团队。这些做法是让研究生深入了解未来从事方向，确认自己的兴趣点，有利于激发主动性。研究生一年级一方面通过教学过程获得方向上的理论知识和研究方法；另一方面各个导师团队开始布置相关方向文献阅读和分析，开始让学生参与实验研究或理论计算等实践过程。以此方式，学生和导师间形成互动和加深认识。心理辅导工作室深入各个团队方向进行跟踪调研学生心理活动，诊断识别有没有危险发生，然后及时采取措施。措施基本上有两种：一是要求团队导师在指导上改变方式方法，做到因材施教；二是调整研究方向，进入新团队从事研究。

研究生一年级末进行开题，一方面论证学生研究课题的可行性，另一方面导师和学生相互认同，确定师生关系。开题完成后，导师成为指导具体科研创新的主要负责人，团队内导师相互配合。在这个环节可能会出现多名学生选择一位导师，而个别导师无人选的境地。因此开题确认导师这个环节是心理辅导工作室重点关注点，一要及时对未选择上心仪导师学生进行心理辅导，帮他走出思想误区，二要识别导师的失当行为，给导师提出建议或警告。

研究生二年级末进行中期检查，矛盾的焦点通常是科研进展问题以及成果归属问题，心理辅导室在这个环节将发挥关键作用。一方面要进行针对性的心理教育，帮助学生释放心理压力和正确对待科研失败或挫折；另一方面把学术不端行为扼杀在萌芽中，对导师和学生均能起到一定的震慑作用。中期检查后，心理辅导工作室基本上可以确定重点关注对象，针对关键少数进行个别跟踪并进行心理辅导。

5. 新保障体系的实施效果

经过一届研究生的实施，不但我院研究生极端事件发生率为零，而且“新保障体系”在多方面发挥了出色效能。首先，无论是导师反馈还是研究生日常表现均证明研究生学习和科研的主动性得到了增强，主动问问题、主动发表自己见解以及主动谈个人科研理想等现象频率增加。其次，导师和研究生间的沟通更加畅通，团队内导师合作活动更加紧密，因学生学术要求增加例会场次增加，很大程度上也带动了学院内的学术氛围。再次，研究成果质量得以显著提升，发表 SCI 论文、“三高”论文和申请国家发明专利数量得到显著提升，省级、校级优秀学位论文分别增加了一倍和三倍。最后，经问卷调查研究生就业满意度接近 100%，考博和出国深造的学生也比往年增加了近一倍。因此，“新保障体系”的实施让学生的自信心和自我认同得到了增强，除了使他们获得了更好的创新能力之外，更重要的是让他们有了更好的未来规划和奋斗目标。此外，对导师队伍建设也起到了积极作用，不仅使青年导师得以尽快成长，而且使导师履行立德树人的使命担当更加充分。

6. 结论

通过组建以心理素质培养为中心的教育工作室，实施思政和心理教育功能，参与学科团队、导师培养研究生的全过程。另外，利用激励与约束机制，把心理教育工作室、学科团队和导师个体三者间的协作、监督、发展统筹在一起，从而保障了研究生的教育质量。实践验证表明所提出的保障体系不仅增强了研究生的自信心和自我认同，而且极大的推动了学科特色团队的建设，提升了育人效果。

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基于文献分析的研究生创新能力培养方法探析

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摘要:培养创新能力是研究生教育的核心,而如何能够把一般才智的研究生,在较短的时间内培养成最优秀的人才是导师们长期研究的复杂性课题。结合自身指导研究生的经验,提出了一套基于文献分析的创新能力培养方法。该方法能让学生快速聚焦前沿科学问题,通过自我求证、自我认同的体验,激发他们的好奇心和求知欲,变被动为主动进行科研创新训练。经推广实施后,得到了导师和学生的普遍认可,对青年导师和自主性不强的学生具有极大的帮助。

关键词:研究生教育;创新能力培养;研究生管理;培养策略

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白春礼院士曾提出“研究生教育的核心是培养创新能力”^[1],而且这一观点已经得到很多教育专家、学者的认同。培养研究生独立思考、解决问题的能力和创新精神,将极大影响其未来事业的格局和成就。教育部《面向 21 世纪教育振兴行动计划》也强调“瞄准国家创新体系的目标,培养、造就一批高水平的具有创新能力的人才”^[2],显然研究生是这一计划中的核心组成部分^[3]。那么如何培养研究生创新能力呢?当前尽管已提出了很多科学又合理的保障体系和理论观点,但是实施效果和质量并不能统一,关键原因是导师水平、学生成绩、科研条件等多方面不能一致。本文探索一种培养研究生创新能力的方法,以供广大研究生导师参考,也有助于研究生尽快进入创新能力养成过程。

一、研究生创新方法的研究背景

本科教育培养的效果是使学生维持性学习能力显著增强,而创新性学习能力往往不足。特别是地方普通高校学生,通过攻读研究生改变“出身”是他们的迫切希望,所以本科三年级、四年级花大量时间用于学习研究生入学科目,而不能充分地进行专业创新训练。维持性学习是通过学习获得原已确立的观点、方法和原则,应付已知的或重复发生的情况的一种手段;创新性学习以不确定性知识为内容,是在不确定性知识观支配下的一种学习方式,它以问题为中心,获得的是能力的提升^[4-5]。因此,这两种学习方式具有不同的特点、指向和作用。本科生缺少获取不确定性知识的能力,通常表现是进入研究生学习之后,无法自主确定一个值得自己研究的问题作为论文的选题,不但影响他们科研的主动性和兴趣,而且极大地阻碍了对他们创新能力的培养。

以中北大学为例,通过调研多个科研团队的导

师,以下四类研究生比较常见:(1)不知道自己做什么,但是很勤奋很努力。上课、看文献、学习仪器操作、准备例会周报等都很认真,但是看不到他的主见和质疑,从而也不知道什么是创新性问题;与他交流时,喜欢把老师说的认真记下来,后期也会按要求一板一眼地做好,但是缺乏判断力和随机应变能力。因此,这种类型研究生常常是付出和收获不成比例,很难取得原创性成果。(2)自我认识不明,眼高手低。维持性学习能力很强,能快速理解文献,但是无法提出具有建设性、创新性问题,或者能提出方向性问题却不能具体完善。自我感觉什么都比较容易,但是一做实验就到处是问题;缺少谨慎、小心求证精神,比较粗枝大叶。因此,这种类型研究生实践能力差,实验过程比较坎坷,也比较难出高水平成果。(3)主动思考,目标明确。这类学生占比较低,但是导师最喜欢指导的一类。他们通常以兴趣为导向,主动求索,积极交流想法,具有强烈获取导师认同的愿望。这类学生往往能够举一反三,师生沟通顺畅,导学相长,最容易产生意想不到的高水平成果。(4)目标不科学,科研动力不足。这类学生占比也比较低,他们往往仅以获取学历证书为目的,不关心和在乎创新能力的培养,一心两用或多用,对科研创新过程不感兴趣,一心凑合毕业。导师遇到这类研究生最为头疼,做思想工作将会贯穿整个培养过程,挫败感强。

然而,从研究生培养单位角度来看,研究生是没有差异的,对培养他们质量的标准是同一个尺度^[6]。例如:学硕通常有发表论文等反映学生学术水平的指标,但是科研有成功就有失败,短短一年内出高水平的成果论文实际上非常有挑战,学生压力也非常大,导师也不希望学生承担太大科研风险,所以探索行之有效的指导方法使不同类型研究生快速进入科

研创新过程成为了导师长期的艰巨任务。

二、基于文献分析的研究生创新方法的形成

(一) 研究生创新方法训练过程

结合团队多年的研究生指导经验,反复对比并结合团队导师的体验,发现以下方法(见下图)对研究生创新培养最为有效。

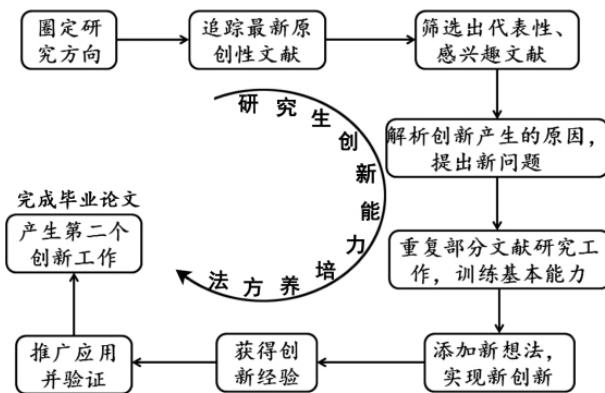


图 研究生创新能力培养方法

首先,在研究生一年级第一学期通过讨论交流为他们圈定研究方向,布置任务让他们检索确定前沿问题并追踪到最新原创工作,借助例会检查汇报,训练学生的检索查新基本能力,理出具体科学问题线索。

然后,要求他们筛选出感兴趣的代表性文献,精析这些代表性文献创新点的起因,开展创新问题提出训练,最终就代表性文献提炼出新问题和新研究思路。

其次,以文献工作为基础让学生先重复其部分内容,开展实验研究。通过重复结果与文献描述的现象、结果对比,一方面锻炼实验动手能力和实验基本技巧,学会解决具体问题,另一方面学生可以体验自我纠错过程,培养科研基本素养。

再次,在成功重复文献的基础上,施加新的想法并进行创新研究。虽然在这个过程中可能将面临诸多不确定问题,但是学生已经得到了一定的训练,而且对产生的问题有了较准确的认识和兴趣,所以实现突破性成果已变得可能。

最后,获取成功创新经验后,在从事的研究方向内再确定新的研究问题,对创新经验进行推广应用。通过再产生第二个创新成果,获得深刻体验和认识,利用撰写毕业论文升华经验,形成内在能力。

以上方法的核心是筛选代表性文献,然后以文献工作作为前提进行新问题设计和实践创新研究。因为创新绝不是纸上谈兵,它源于实践并要付诸实践才能产生,所以无论参与导师课题项目还是源于兴趣自己提出的问题,都需要多做实验、多从事实践活动才能把学生引入科研大门^[1]。但是,做实验过程中研究生需要自我验证和自我求证,确定自己的方法和技能是否可靠,显然参考文献研究是最为经济和可行的方法。一方面通过重复文献工作学生能求

证自己的实验结果,体验科研过程;另一方面如果重复不成功还能促使学生主动求取知识,理性看待文献工作,激发其质疑能力,从而为日后的创新研究奠定基础。

(二) 导师的指导作用及其实施方式

在研究生创新方法训练过程中,导师不能做局外人,其及时指导对训练效果起着重要作用。导师在其中的指导包括两个方面:一是在一般性方法上的指导,就研读文献的基本方法、从文献中提出创新想法的基本方法、实验探索过程中如何发现创新思路的基本方法以及如何培养创新思维的基本方法等方面进行指导和典型示范,让学生能够及时领悟科研创新能力的培养过程和技巧,尽快进入自我求索的状态;二是在心理上的指导,科研过程从来不是一帆风顺的,失败总是比成功多,对于科研初学者研究生更是在科研创新锻炼过程中会遇到这样或那样的诸多问题,心理承受能力过硬也就成为了研究生创新培养中的关键要素,所以导师要及时关注学生状态,善于在平时结合具体科研问题对学生进行心理建设指导,让学生能尽快走出失败阴霾并能实现自我心理强化,不断提升自我疏解能力。根据学生的实际情况,实施的指导可有多种方式,除了通过一对一指导解决学生个性差异问题及具体科研实际问题外,一般群体性的指导方式可选用以下几种:

第一种,文献分析专题例会,即在例会上通过学术沙龙或头脑风暴的形式,围绕一个特例,示范如何了解学术前沿,如何从文献中提出问题,如何凝练创新想法,如何制定实验方案等,让学生一边参与,一边观摩,从而促进学生快速找到创新问题,达到少走弯路的目的。

第二种,榜样现身示范交流会,即让高年级做法比较好的研究生,结合自身体验与一年级研究生进行交流,解析各种实际存在的困惑并传授好的做法经验。此外,通过这种方式还有助于提升课题组学术氛围和合作精神,对一年级研究生有较好的归属感。

第三种,实验室技能培训会,即培训学生如何设计可行实验,如何认识实验中的危险、如何操作实验仪器设备、如何分析数据、如何制作规范的科学图表等,尽快让学生融入科研,打造学生基本的科研素养和能力,为顺利开展创新实验奠定基础。

第四种,阶段总结会,及时让学生总结创新方法训练过程中成功之处与失败原因,重新审视原先创新想法,导师对问题做针对性指导。一方面有助于导师全方位掌握学生的现状,采取合适的指导方法;另一方面有助于起到监督与督促作用,激发学生科研动力。

上述四种指导方式应反复穿插进行,不断强化并持之以恒方见效果。

三、基于文献分析的研究生创新方法的实践及其效果

为了验证上述基于文献分析的研究生创新方法的有效性,针对性地设计了对比实验,具体采用的实践方法和过程如下:

实施周期:研究生培养的一个完整周期。实施范围:专业背景相同的一个学院。实施方式:分为四个组,其中一个组为青年导师组,完全采用上述研究生创新培养方法;另一个青年导师组主要围绕自己主持的项目进行研究生创新能力培养,即给出明确的研究方向和具体的科学问题;第三组为年长导师组,按自己长期指导经验进行指导,手段可以多样,但要求避开上述提出的研究生创新方法;第四组是针对思考主动性不强、目标不清楚的研究生类型进行应用。验证指标为发表学术论文质量与数量、毕业学位论文综合评价水平、研究生创新能力问卷调查。质量保障制度体系采用同一个学院的要求和标准,如教学培养方案、实践能力学分、达到毕业条件指标等。

经过三年的实施,得到以下结果:采用上述研究生创新培养方法的青年导师组指导的学生发表的SCI收录论文数量比未采用的青年导师组的学生平均高出了约70%,而比有经验的年长导师组的学生也平均高出了约50%;毕业论文盲审评审结果获得优秀评价的数量也普遍高于未采用上述研究生创新培养方法的导师组。第四组作为单独样本与主动思考、目标明确类型的研究生培养结果进行了对比,发现采用上述研究生创新培养方法后,有超过一半以上的研究生取得的成果质量和数量与主动思考、目标明确类型的研究生相当,而有少部分表现得比这部分研究生还优秀。

针对四个导师组研究生问卷主要围绕他们对自己所从事科研的兴趣、取得的成果、创新影响因素、科研反思等在中期检查和毕业答辩后进行了调查,问题类型比如:①你对目前进行的科学研究内容是否感兴趣?②你对目前研究所取得的成果是否满意?③在从事科学研究中,你认为影响成果质量的因素是什么?④你对你的研究进展是否满意?主要困难来自于自身能力还是研究条件?⑤你是否觉得你在研究生期间能够达成你的科研目标?⑥经过一段时间的科学研究后,你确定自己更适合还是不适合从事科研?⑦你是否经常主动看文献,寻求新的科研想法?⑧从事科研后,你是否感觉在分析问题和解决问题能力上有所提升?等等。经回收分析之后发现:经历研究生创新培养方法体验后,科研自信心普遍增强,近九成研究生感觉在分析问题和解决问题能力上得到了提升;认为取得了自己非常满意的成果超过了30%,取得了自己满意的成果超过了65%;认为自己可以从事科学研究并打算继续攻读博士学位的比例比未参与创新培养方法的研究生超

过了60%。围绕基于文献分析的研究生创新培养方法效果体验,对参与对比实验研究的导师进行了座谈,一致认为所提出的研究生创新培养方法是比较好的方法,特别是对于缺乏指导经验的青年导师和主动性不强的研究生会取得非常好的效果。此外,经导师反馈采用这种方法后还有助于开拓新的交叉领域,拓展科研范围。

四、基于文献分析的研究生创新方法的推广意义

“我们能够把一般才智的年轻人,在较短的时间内培养成最优秀的人才”是英国著名科学家亨利·卡文迪许实验室的名言^[1]。经过实践证明我们提出的研究生创新培养方法具有这样的效果,所以希望推广到更大范围应用,求证它的普适性。

作为导师的首要任务就是培养研究生的创新能力,但是如何引导学生拥有创新思维以及强烈的好奇心和求知欲对导师来说仍有巨大挑战^[2]。一方面取决于研究生的个性、教育背景等因素,另一方面取决于导师水平及其所能提供的科研条件等因素。特别是对于年轻导师来说,不仅缺少因材施教的经验,还缺少足够的科研广度和条件,有一种可参考和应用的研究生创新培养方法对他们来说可谓及时雨。对于研究生来讲,了解和认识如何快速进入创新过程也是非常重要的,有助于他们提出科学问题和个性发展。因此,推广基于文献分析的研究生创新方法的意义在于导师和研究生之间可形成共同接洽的纽带,快速孵化批判性思维,发现研究问题,实施创新过程,收获创新能力。

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Research Article

Analysis of College Students' Psychological Education Management in Public Emergencies Based on Big Data

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In recent years, college students' psychological problems have occurred frequently, and the early warning of college students' psychological crisis has received social attention. Artificial intelligence and big data, as emerging technologies that have attracted much attention in recent years, have broad application and development space in improving the development of intelligent and refined education in colleges and universities. Applying artificial intelligence and big data to the practice of college students' mental health education plays a very positive role in accurately finding and scientifically solving college students' mental health problems. This paper combs the current application and research of artificial intelligence and big data in college students' mental health education and then clarifies the problems existing in the practical application. Finally, on the basis of in-depth analysis of the characteristics of college students' psychological crisis, the paper designs college students' psychological crisis early warning data collection system from six aspects, including the educational administration system and the access control system. And from the aspects of establishing a multilevel linkage feedback early warning system, building a team of big data technical personnel and mental health education personnel, it puts forward countermeasures for college students' psychological crisis, so as to provide theoretical and methodological support for college mental health management.

1. Introduction

With the rapid development of society and big data technology, college students are facing more and more academic, employment, emotional, and economic pressures, which has seriously damaged the original balance ecology of mental health [1]. According to an authoritative survey released by an authoritative organization in China, about 10%~25.4% of college students in many places will have some mental diseases for various reasons and mainly freshmen. These psychological problems of a freshman have become increasingly prominent because of the vicious events such as leaving, suspension, dropping out, and suicide caused by psychological problems. Therefore, the early warning of freshmen's psychological problems has become an important problem that cannot be ignored and urgently needs to be solved in Chinese universities [2].

Although the students entering the university tend to be rational and mature in terms of knowledge and mind, they lack a deep understanding and experience of the reality

and have a certain degree of vulnerability in terms of psychology, which leads to their mental health problems due to some bad experiences [3–6]. With the increasing pace of life and learning pressure, mental health has obviously become a prominent problem among college students. Therefore, more and more colleges and universities have incorporated mental health education into the college students' education system, hoping to enhance the ability of college students to discover and solve all kinds of psychological problems of these freshmen or seniors through professional and targeted mental health adjustment. However, the diversity of students' mental states and the lack of teachers' resources for mental health education make it difficult for students' personalized mental health education needs to be effectively met, and mental health education is often reduced to a public knowledge course [7, 8]. Under such circumstances, it is important to ameliorate college teachers' ability to screen, locate, and analyze mental health of students in school with the help of technical means so that teachers can focus more practice and energy on helping

students solve psychological problems [9, 10]. Artificial intelligence and big data, as emerging technologies, can precisely meet the needs in this regard.

Since Caplan (1954) put forward the concept of psychological crisis, scholars have conducted a lot of research around psychological crisis. The research related to this paper is mainly reflected in the influencing factors of psychological crisis of college students [11, 12], early warning index system and early warning model of psychological crisis, early warning mechanism system, and early warning intervention management [13–15]. Weist et al. [16] believe that the causes of college students' psychological crisis are complex, and individual factors, family influence, and social environment have an important impact on students' psychological health. Perfect et al. [17–19] used the method of superiority relationship classification to obtain the factors causing psychological crisis of college students.

Reavley et al. [20] analyzed the difference in psychological stress between Chinese and American college students and explored the impact of stress on individual suicidal ideation and depression. Swisher determined the early warning indicator system of psychological crisis from three dimensions: external event indicator, individual information indicator, and social relationship indicator. The development of big data technology has provided a new means for the study of college students' psychological crisis, which has attracted the attention of many scholars. The research in related aspects mainly includes the necessity and feasibility of big data technology in college students' psychological research, implementation methods and model construction [21–23], and application system design. Talbott et al. [22, 24] believe that the traditional psychological crisis early warning system in colleges and universities is inefficient and excessively dependent on clinical scales. Therefore, big data thinking should be integrated into the psychological crisis early warning work in colleges and universities. Chen et al. [25] proposed an innovative path for college students' mental health education in the context of big data. Guedes et al. [24] introduced the concept of big data into the field of mental health education in colleges and universities, analyzed the mental health data of college students in detail, and established a model of mental health data feedback system. To sum up, the research on college students' psychological crisis early warning under the background of big data will be a new trend in the future. We should use big data technology and combine various data systems on campus to build a psychological crisis early warning system.

Existing studies have found that some scholars have put forward the conceptual model and mechanism of psychological crisis management based on big data [26, 27], but the operability is not strong. Based on this, on the basis of analyzing the concept and characteristics of college students' psychological crisis, combined with the problems and the needs of college students' psychological health education, this paper puts forward suggestions on deepening the application of technology in college students' psychological health education, systematically builds a college students' psychological crisis early warning system under big data, and puts forward scientific, targeted, and effective countermeasures

and reference methods for college students' psychological crisis, in order to provide theoretical and methodological support for college mental health management.

2. The Concept and Characteristics of Young Students' Psychological Crisis

2.1. Concept. Academic circles have different views on the specific concept of psychological crisis. At present, the definition of the connotation of psychological crisis mainly meets the following conditions: ① psychological crisis is the manifestation of the conflict between ideal and reality in people's daily life, ② psychological crisis is a variety of negative emotions that individuals cannot find a way to deal with or solve sudden things, and ③ psychological crisis is the psychological and physiological imbalance caused by individuals' failure to cope with external interference. To sum up, college students' psychological crisis refers to the psychological imbalance caused by college students' failure to respond in time after encountering emergencies and then showing high tension, anxiety, confusion, and other negative emotions.

2.2. Characteristics. University is an important stage of life. College students who are separated from the supervision and assistance of their parents need to face the problems of professional study, making friends, employment, postgraduate entrance examination, etc., and their life in university is collective and free. Therefore, this paper believes that compared with other groups, college students' psychological crisis has the following characteristics:

- (1) Concealment: the management of the university is relatively free. The teachers, counselors, and class teachers have limited contact with the students in the class, so they cannot know the real psychological status of the students. However, the classmates who contact the most often do not have the ability to identify psychological problems. When psychological problems cannot be solved in a timely manner, psychological problems tend to accumulate into a big one and turn into a psychological crisis
- (2) Danger: when college students encounter psychological crisis, it is usually difficult to complete psychological repair alone. Without the help of the outside world, they are prone to fall into the vortex of self-denial and even to harm others and commit suicide
- (3) Sudden crises are often unexpected and uncontrollable. For example, the SARS epidemic in the spring of 2003 caused great panic to the college students in Beijing at that time. At that time, the normal study and life rank were disrupted; the destruction of the order, the departure of classmates and friends, and the isolation of the campus have all caused serious psychological crisis to college students
- (4) The arrival of helplessness psychological crisis often makes people feel at a loss, and people's future plans

are threatened and destroyed. Because the previous coping style cannot cope with the crisis and the social support system is not perfect, college students often feel helpless and desperate.

3. Challenges Faced by Big Data Application in Related Fields

3.1. Insufficient Attention to Technology Application. These years, the extensive use of artificial intelligence and big data in the business field has gradually deepened the perception and recognition of the practical value of these emerging technologies by colleges and teachers, but few colleges and universities really practice from the perspective of technology in related fields and psychological education for young students. On the one hand, this problem of low attention limits the effective application of scientific research achievements in big data and other place to the practice of young students' mental health guidance, making the mode of young students' mental health guidance too old and ineffective. On the other hand, it also weakens the research and practical exploration of some college teachers on the application of artificial intelligence and in young students' mental health education and lacks corresponding conditional support, which cannot change the good to promote this education.

3.2. Difficult Technical Development. Big data is a universal technology. Research shows that these technologies can be applied to college students' mental education. There is a lack of clear and mature content guidance on how to apply, which makes the application of artificial intelligence and big data in young students' mental education more difficult. Meanwhile, the application of big data in young students' health education involves the integration of professional technologies such as big data and professional disciplines such as psychology, which requires that personnel involved in technology development not only understand the technical growth of young students' mental health education system or platform but also understand the professional knowledge of psychology. Obviously, such talents are scarce among the new college talents in this period; this makes the application of big data in college students' mental health education face greater technical difficulties.

3.3. Data Sharing Is Difficult. In the application of 5g network, artificial intelligence, cloud computing, big data, "Internet of things+", and other information technologies, education management methods, models, and systems have been innovated and strengthened, and the status and value of management data in daily education management have been enhanced. Meanwhile, educational institutions and schools have gradually strengthened interschool exchanges and cooperation and paid attention to the sharing and circulation of education management data. However, due to the diversity and large number of big data in education management, it is difficult to achieve effective compatibility and sharing. For example, in the process of software construction and hardware construction, there are obvious differences

among different cities, regions, and schools, resulting in many problems in the process of data transmission and sharing.

3.4. The Effect of College Students' Participation Is Not Good. Although the application of artificial intelligence and big data can improve the pertinence and accuracy of college students' psychological education, the premise to achieve this effect is to have enough data information so that various models and systems can operate on this basis. In other words, college students' participation in psychological education activities is the premise and foundation for big data to play its role in your field. At present, few students are able to take the initiative and participate in relevant activities in this field. Some students are worried about the leakage of their personal information, and they are not willing to participate in this kind of mental health education. This poor participation results in the poor role of technology in the mental health education of college students, significantly affecting the application of artificial intelligence and big data.

4. Construction of Psychological Crisis Early Warning System Based on Big Data Technology

There are a large number of students in universities. Students' big data belongs to scattered information resources, and its information value is extremely limited. However, using big data technology for in-depth mining and comprehensive utilization can transform these scattered information into valuable information and finally achieve the effect of information serving universities and students.

4.1. Collection of Psychological Early Warning Data. University is a process in which we gradually change from a student to a professional. During this period, we will inevitably experience various hardships and pressure will be generated in all aspects. Due to the limited psychological endurance and digestion ability, college students are prone to psychological imbalance. After reading the literature and in-depth research, this paper analyzes the following psychological warning data sources. Class attendance and examination results of each semester: take the professional course of a college student with 10 classes per week as an example, through random sampling survey of 8000 students in the school, the number of students in the sampling survey is 100, and the results of 100 students are summarized and averaged. The survey results are shown in Table 1.

Figure 1 describes the relationship between college students' attendance and their average scores. From the figure, it can be seen that if students are always late or absent from class, their average scores will be lower, and there is basically a positive correlation. However, for some special cases, some students still have high scores despite less class times; it is necessary to find out the reasons, whether they are part-time or have an improper weariness of learning due to economic difficulties. Usually, the school will have a relatively strict attendance system, requiring the class study committee to arrive before each class, count the list of students who are

TABLE 1: Attendance of three professional courses of college students and examination results of each semester.

Attendance times	Professional courses		
	1	2	3
10	90.0	95.7	87.6
9	92.1	91.6	91.5
8	88.4	92.3	95.3
7	75.3	84.7	77.6
6	70.1	80.2	81.7
5	71.7	63.9	60.3
4	55.8	61.8	59.7
3	42.0	50.4	45.0
2	49.8	45.0	48.0
1	50.1	44.6	30.2

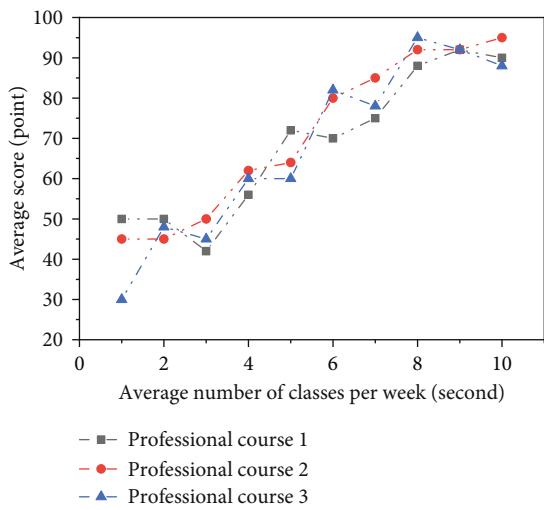


FIGURE 1: Psychological warning data—relationship between grades and class times.

late and absent, and submit it to the school study department every weekend. Then, the learning department will hand it over to the counselors. The Academic Affairs Office will keep the academic results of each student in each semester, and the data is easy to collect.

For dormitory access control system data, the survey statistics are shown in Figure 2. Taking the time of boys' arrival at bedtime as an example, two main data are grasped. One is the earliest time to swipe the card every day, and the other is the time to return to the dormitory at night. If the time of going out of the dormitory every day is after 11:00, such students are very likely to have the bad habit of staying in bed, staying up late, and getting up late. Such students are prone to feel confused about college life, which deserves attention. The late return to the dormitory but before the deadline of access control may be due to the high pressure of learning, part-time work, etc. If you frequently return to school in the early morning, you need to pay special attention.

In addition, the consumption data of school campus card and the payment of educational administration system can also reflect the mental health of students. Understand

the fluctuation of students' consumption through the campus card and judge whether the students' life is stable. From the academic affairs office, we can learn about the payment of students' tuition fees. Most of the students who have been in arrears for a long time are in financial difficulties and face the pressure of the school to urge them to pay their tuition fees. However, we cannot rule out that some students use their tuition fees for other purposes, which leads to arrears. In any case, they need to bear the pressure psychologically. Data was published by students on major social networking sites. The Internet is the main way for college students to vent their emotions. The main social software we use are QQ, WeChat, and Weibo. With the consent of students, we regularly obtain valuable information related to mental health through big data technology.

Interpret the psychology of students from the perspective of psychology. There will be different troubles at different stages of the university. Generally speaking, in the freshman stage, it is easy to be far away from home, have no friends, feel lonely or do not like your major and school, and need a process of adaptation to the life on the university campus. In sophomore and junior years, emotional problems, such as interpersonal problems or love problems, are more likely to occur. In the third and fourth years of the university, the students are about to graduate. The biggest pressure of the students who take the postgraduate and civil service examinations comes from their heavy learning tasks. The students who are directly employed often have no confidence in their abilities and worry about their future development. In general, different students should have different problem preferences and should make full use of the file information of the students when they enter the school and keep the data updated in four years. At the same time, all data should be electronic and sent to the mental health education center to facilitate the analysis of the psychological crisis early warning system.

4.2. Construction of Psychological Crisis Early Warning System Based on BP Neural Network

4.2.1. Principle of BP Neural Network. From the principle of the neural network, it can be found that the initial goal of the network is to simulate the working mechanism of human brain neurons. By setting up a series of neurons in the network to sense external signals or some stimulating behaviors, these perceived signals are transmitted to the internal perception unit through a neuron called input gate and propagate along the forward direction. At the same time, in the process of propagation, back feedback the propagation error to adjust the model, so as to establish a network in which the skill is passing through the propagation signal and the error can be transmitted back to form a BP neural network. Its network structure is shown in Figure 3.

In this picture, n and k represent the number of input signals and output results, respectively; θ represents the connection weights between the layers, including the weights between the input layer and the hidden layer, the weights between the hidden layer and the hidden layer, and the weights between the hidden layer and the output layer; and

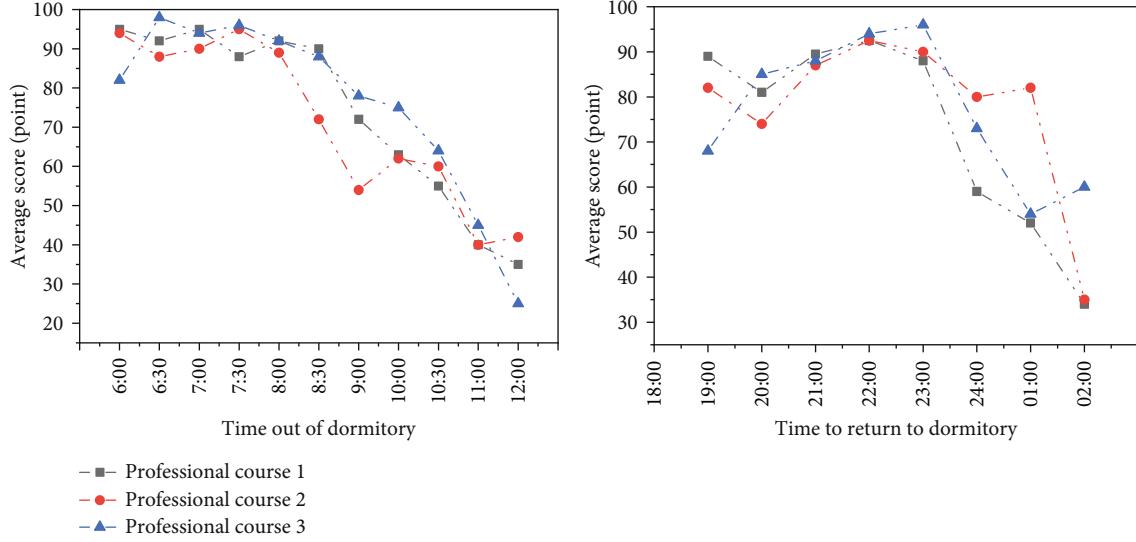


FIGURE 2: Dormitory access control system data—relationship between score and bedtime.

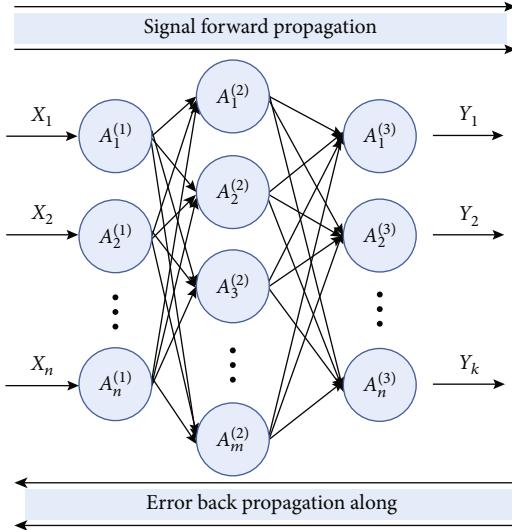


FIGURE 3: BP neural network structure diagram.

$a_j^{(i)}$ represents the excitation value, where i represents the network layer. Therefore, the BP neural network can be regarded as a nonlinear function. Through repeated learning, it can adjust the connection weights between multiple neurons and discover the complex rules within the data and has good robustness and fault tolerance.

4.2.2. BP Neural Network Operation Process. This section introduces the operation process of the BP neural network in combination with its learning algorithm and takes the three-layer BP neural network as an example. The specific process is shown in Figure 4.

Suppose that the input layer neuron node of the BP neural network is x_n , ($i = 1, 2, \dots, N$), the hidden layer neuron node is z_j , ($j = 1, 2, \dots, J$), and the output layer neuron node is y_k , ($k = 1, 2, \dots, K$). The connection weights between the hidden layer and the input layer and the output layer are

μ_{nj} and ω_{jk} , respectively. The interlayer thresholds are represented by γ_j and θ_k , respectively, and the expected output value of the output layer is d_k .

Step 1. Set initialization parameters and learning parameters and input sample data. Initialization parameters include connection weight ω_{jk} and thresholds γ_j and θ_k . Learning parameters involve learning rate η , ε transfer function, allowable error δ , training times M , and the number of neuron nodes at each layer.

Step 2. Secondly, according to the optimization results of the previous step, the network function is used to calculate the values of each layer. The output value of the layer can be calculated from the formula in z_j below, and the output value of the layer can be calculated from the formula in y_k below.

$$z_j = f\left(\sum_{n=1}^N \mu_{nj} x_n - \gamma_j\right), \quad (1)$$

$$y_k = f\left(\sum_{j=1}^J \omega_{jk} z_j - \theta_k\right). \quad (2)$$

Step 3. Next, in the third step, after solving the values in the second step, we need to use the following formula to solve the mean square error:

$$E = \frac{1}{2} \sum_{k=1}^K (d_k - y_k)^2 = \frac{1}{2} \sum_{k=1}^K e_k^2. \quad (3)$$

Step 4. Judge whether the BP neural network training is over. When the mean square error E is less than the allowable error ε (network convergence) or when the training times exceed the preset M value (the network cannot converge), the training ends. When the mean square error E is greater

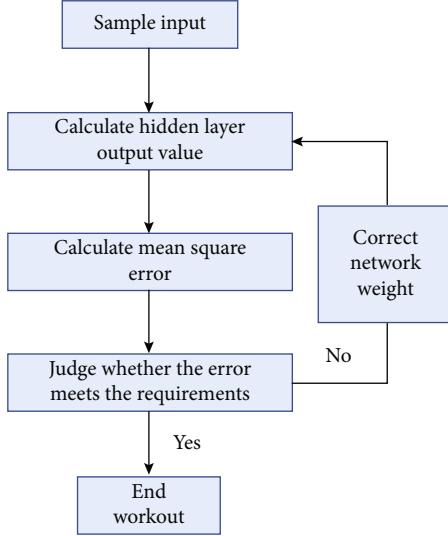


FIGURE 4: BP neural network operation flowchart.

than the allowable error, it is necessary to calculate the output layer correction error δ_{jk} and the hidden layer correction error δ_{nj} according to

$$\begin{aligned} \delta_{jk} &= -\frac{\partial E}{\partial (\sum_{j=1}^J \omega_{jk} z_j - \theta_k)} = -\frac{\partial E}{\partial y_K} \frac{\partial y_K}{\partial (\sum_{j=1}^J \omega_{jk} z_j - \theta_k)} \\ &= \sum_{k=1}^K (d_k - y_k) y_k (1 - y_k), \end{aligned} \quad (4)$$

$$\begin{aligned} \delta_{nj} &= -\frac{\partial E}{\partial (\sum_{n=1}^N \mu_{nj} x_n - \gamma_j)} = -\frac{\partial E}{\partial y_K} \frac{\partial y_K}{\partial z_j} \frac{\partial z_j}{\partial (\sum_{n=1}^N \mu_{nj} x_n - \gamma_j)} \\ &= \delta_{jk} \omega_{jk} z_j (1 - z_j). \end{aligned} \quad (5)$$

Step 5. Modify the weights and thresholds of neurons at each layer. Modify the connection weights according to formulas (6) and (7) and modify the thresholds of these two layers according to formulas (8) and (9). When the weights and thresholds are updated, continue with Step 2 until the end of the training.

$$\begin{aligned} \Delta \mu_{nj} &= -\eta \frac{\partial E}{\partial \mu_{ij}} = -\eta \frac{\partial E}{\partial (\sum_{n=1}^N \mu_{nj} x_n - \gamma_j)} \frac{\partial (\sum_{n=1}^N \mu_{nj} x_n - \gamma_j)}{\partial \mu_{nj}} \\ &= \eta \delta_{nj} x_n, \end{aligned} \quad (6)$$

$$\begin{aligned} \Delta \omega_{jk} &= -\eta \frac{\partial E}{\partial \omega_{jk}} = -\eta \frac{\partial E}{\partial (\sum_{j=1}^J \omega_{jk} z_j - \theta_k)} \frac{\partial (\sum_{j=1}^J \omega_{jk} z_j - \theta_k)}{\partial \omega_{jk}} \\ &= \eta \delta_{jk}, \end{aligned} \quad (7)$$

$$\begin{aligned} \Delta \gamma_j &= -\eta \frac{\partial E}{\partial \gamma_j} = -\eta \frac{\partial E}{\partial (\sum_{n=1}^N \mu_{nj} x_n - \gamma_j)} \frac{\partial (\sum_{n=1}^N \mu_{nj} x_n - \gamma_j)}{\partial \gamma_j} \\ &= -\eta \delta_{nj}, \end{aligned} \quad (8)$$

$$\begin{aligned} \Delta \theta_k &= -\eta \frac{\partial E}{\partial \theta_k} = -\eta \frac{\partial E}{\partial (\sum_{j=1}^J \omega_{jk} z_j - \theta_k)} \frac{\partial (\sum_{j=1}^J \omega_{jk} z_j - \theta_k)}{\partial \theta_k} \\ &= -\eta \delta_{jk}. \end{aligned} \quad (9)$$

4.2.3. System Construction Based on BP Neural Network. Through the preliminary work, the database of the psychological crisis early warning system has six aspects: attendance, academic performance of each semester, time of going in and out of the dormitory, consumption of campus cards and whether the tuition fees are paid on time, data from social networking sites, information reflected by class psychological committee members, and mental health diagnosis scale. Then, it can predict the psychological status of students through big data processing, mining, and analysis. After the prediction results are obtained, they are fed back to the school mental health education center. The physical and mental education center cooperates with the counselor. The counselor contacts the parents and uses professional psychological counseling methods to help the students with psychological crisis. The overall process is shown in Figure 5.

4.2.4. Result Analysis of BP Neural Network Model Training Set. Through Section 4.2.3, we have completed the construction of the psychological crisis early warning system based on the BP neural network model, and through the analysis of the campus psychological database about the students' academic performance in each semester, the time of entering and leaving the dormitory, the consumption of the campus card (average daily consumption expenditure), and whether the tuition is paid on time, the situation is reflected by the class psychological committee. The data of the six aspects of mental health diagnosis scale (diagnosis times in a year) (respectively, recorded as a , b , c , d , e , and f) (the results of some of the called data are shown in Table 2) and the above results are used in the training of the BP neural network model to predict the students' psychological conditions. At the same time, in order to compare the reliability of the model in this paper, the data in this paper are used in the conventional model (gray prediction model) for comparative analysis. The prediction accuracy and model prediction error of the two models are taken as the evaluation indexes. The prediction results of the two models are shown in Figures 6 and 7, respectively.

It can be seen from the change of the prediction error of the two different models with the number of iterations in Figure 6 that the test error of the two models gradually decreases with the increase of the number of iterations of the model, and both can reach a small value. However, the difference is that the BP neural network prediction model

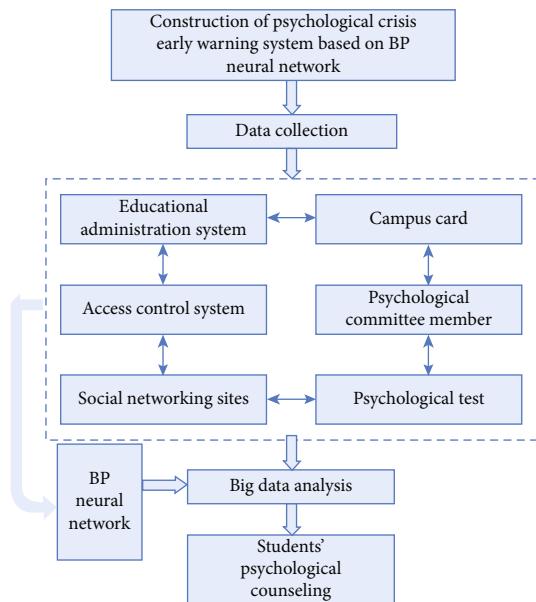


FIGURE 5: Construction of psychological crisis early warning system based on BP neural network.

TABLE 2: Mental health database of campus students.

Students	<i>a</i>	<i>b</i> Enter	<i>b</i> Out	<i>c/RMB</i>	<i>d</i>	<i>e</i>	<i>f</i>
1	84.16	22:17	7:26	21.0	Yes	Healthy	1
2	75.27	23:48	8:25	20.5	Yes	Healthy	1
3	82.14	23:02	8:44	16.0	Yes	Healthy	1
4	52.29	24:51	11:21	30.0	Yes	Unhealthy	6
:	:	:	:	:	:	:	:
<i>N</i> - 1	63.98	20:16	10:25	24.0	Yes	Commonly	1
<i>N</i> - 2	77.21	22:01	6:54	26.0	Yes	Healthy	1

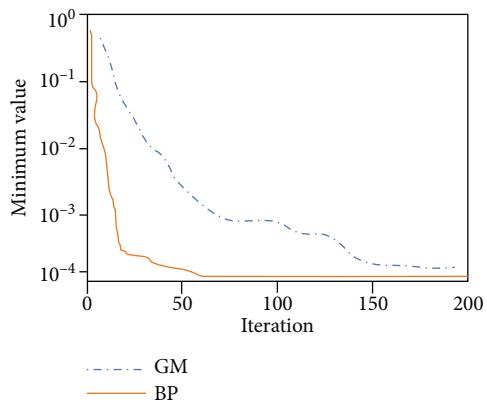


FIGURE 6: Change of prediction error of two models.

constructed in this paper is better than the gray prediction model of the comparison model in terms of the prediction error of the model and the number of iterations of the model. Among them, the error of the BP neural network quickly tends to be stable after traversing about 60 iterations,

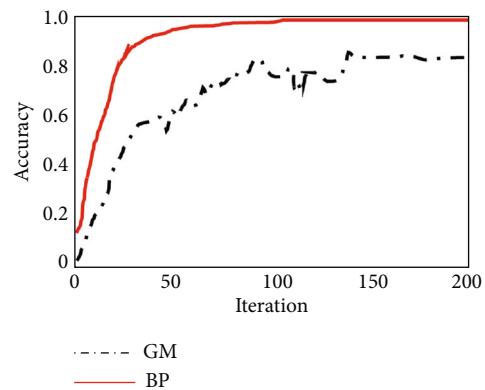


FIGURE 7: Prediction accuracy of two models.

and the final error of the model is close to 10-4, which has reached a minimum error. It can be said that the test error of the model has little impact on the results. In contrast, the prediction effect of the gray prediction model is poor. The test error of the model is not only much larger than that of the BP neural network model but also the number of iterations is more than that of the BP model. It takes more than 150 iterations before the model error tends to be stable. Therefore, compared with the gray prediction model, the training speed and error control ability of the students' psychological change prediction model based on the BP neural network model constructed in this paper are better than those of the gray prediction model.

Figure 6 shows the change of the prediction accuracy of the two different models with the number of iterations. It can be seen that the prediction accuracy of the two models gradually increases with the increase of the number of iterations of the model. However, the difference is that the BP neural network prediction model constructed in this paper is better than the gray prediction model of the comparative model in terms of the prediction accuracy of the model and the number of iterations of the model. Among them, the error of the BP neural network can be rapidly improved to above 0.95 after 100 iterations, and the maximum accuracy is as high as 0.976. In contrast, the prediction accuracy of the gray scale prediction model is poor. The prediction accuracy of the model is not only much lower than that of the BP neural network model but also the number of iterations is more than that of the BP model. After more than 150 iterations, the prediction accuracy of the model can reach the maximum value, and the maximum value does not exceed 0.8. The training speed and prediction accuracy of the student's psychological change prediction model based on the BP neural network model constructed in this paper are better than those of the gray prediction model.

In summary, it can be found that the student psychological prediction model based on the BP neural network constructed in this paper is not only better than other models in terms of training speed and training error but also more accurate in predicting students' psychological conditions, with the highest accuracy rate close to 1, which indicates the effectiveness and superiority of the model constructed in this paper.

5. Countermeasures for College Students' Psychological Crisis Based on Big Data Technology

At present, the development of the psychological crisis early warning system in Chinese colleges and universities has not formed a complete system, and various problems emerge in endlessly, which have seriously affected the response efficiency of colleges and universities to the psychological crisis of college students. Through research, this paper puts forward the following suggestions and measures according to the current situation.

5.1. Establish Multilevel Linkage Feedback Early Warning System. Mental health education centers, schools, colleges, parents, classes, and dormitories should unite to establish a six-level early warning system for psychological crisis and cooperate at all levels to help students overcome psychological problems. The school is responsible for overall planning. The mental health education center is responsible for providing professional psychological assistance. College mainly refers to the teachers led by counselors and class teachers, who are responsible for discovering the psychological changes of students at the first time. The responsibility of the family is not only limited to the students' money input but also needs to bear the responsibility of psychological cultivation. The students in the class, especially the psychological committee members, should help the students with poor psychological conditions and regularly feedback the students' psychological conditions to the counselors and teachers. The six systems shown in the figure not only represent the original information we have obtained but also the most effective tool for counseling and treating young students' psychological weaknesses. In this system, there are many factors that can produce effects, including family, school, and society. Therefore, for the physical and mental problems of young students, the three must work together to make this system effective.

5.2. Encourage Students to Actively Participate in the Construction of Psychological Crisis Early Warning. Usually, it is difficult for people to talk about psychological problems, and they show negative or unconcerned feelings about psychological tests and other psychological problems. However, due to the extensive use of mobile phones by college students, mobile phones do not need face-to-face communication, which reduces more psychological barriers. Through the app, college students are encouraged to actively participate in the psychological crisis early warning system and actively participate in the six functions of the app, including index data query, mental health test, mutual assistance in the forum, daily mood record, psychological status scoring, and psychological consultation appointment so that students can open their hearts to psychological problems and no longer repel.

5.3. Optimize Technology Application Mode. For a long time, college students have shown obvious sensitivity to their own psychological problems and are unwilling to talk about them

too much, which makes it difficult to carry out young students' physical and mental education in an open and public way. Artificial intelligence, big data, etc. can be used with advantages of other platforms, such as the neural network model, so that colleges and universities and teachers can develop personalized young students' physical and mental health education platform with the network as the carrier so that students can log in from this interface at any time and at any place for content understanding and activity participation and truly eliminate the worry of young students about physical and mental education. In the actual operation of these technologies, colleges and universities can develop a physical and mental education platform for all young students and can also develop a personalized mental health education platform according to students' different age, gender, grade, major, and other conditions, meanwhile creating a better learning environment for them and conditions for students to participate in the application of technology. Meanwhile, we need to pay attention to the timely and objective feedback of the results of mental health education so that the young students can really feel the advantages and values of artificial intelligence and big data in mental health education and gradually eliminate the exclusion and resistance of students. For example, teachers can design some personalized questionnaire questions with the help of the system and make corresponding adjustments to the design of young students' mental education platform according to the final feedback results of students, so as to make the platform more appropriate to their lives and changes in their psychological activities.

5.4. Cultivate a Team of Psychological Talents with Big Data Technology. In practice, the mental education center in our universities lacks talents who master data technology, which is one of the important reasons why the psychological crisis early warning system in colleges and universities cannot be improved. This team needs compound talents who not only understand physical and mental education knowledge but also master big data technology. By establishing a university mental health education center with both physical and mental education talents and data technology talents, we can maximize the application of data technology and alleviate the bottleneck of traditional psychological early warning methods.

5.5. Integrate Data Technology Development Resources. The application of big data in college students' mental health education is an innovative content, which requires the participation of professional technical personnel and psychological experts and needs to be continuously developed and improved. Considering the fact that the research and practice ability of colleges and universities in this area is weak at present, we can enhance the ability of technology development and break through the difficulties of technology application through resource combination and other means. In the aspect of resource integration, it can be carried out in different ways, such as cooperation among universities and cooperation between universities and enterprises. For example, strong universities can carry out special research on the

application of artificial intelligence and big data to college students' mental health education through the combination of strong and strong. Through the cooperation of technical experts and psychological experts, they can make up for the shortcomings of universities in technology development and application and create a technical platform that truly meets the needs of college students' mental health education.

In addition, colleges and universities can also carry out technical cooperation with enterprises or organizations outside the university with strong technical strength, integrate their professional advantages in psychology with the advantages of technological development of other organizations, and promote the transformation of relevant technological ideas into technological achievements. At the same time, considering the personalized characteristics of college students' mental health, the relevant subjects should not only pay attention to the development of the early-stage technology platform but also carry out regular technical maintenance and updating according to the follow-up college students' mental health education practice so that the application of artificial intelligence and big data technology can closely follow the development of college students' mental health education practice. For example, colleges and universities can regularly optimize the model in the college students' mental health assessment system to optimize the matching degree between the model and the data in the database.

5.6. Ensure the Data Security of Mental Health Education Center. The university stage is a critical time for people's growth. College students at this stage are extremely sensitive and unstable and dare not touch topics like psychological problems and psychological crises easily. In essence, colleges and universities establish a psychological crisis early warning system to help students. After obtaining the psychological status information of students, they should ensure the absolute security of the information and limit the number of APP information input ports. Counselors, class teachers, and psychological committee members should strictly keep students' secrets, so as to avoid the effect contrary to the original purpose.

6. Conclusion

In view of the current situation of frequent psychological crisis of college students, this paper uses big data technology to make up for the shortcomings of traditional psychological crisis warning methods. After collecting the six aspects of psychological early warning data, the big data technology is used to analyze, mine, and predict the data. The mental health education center and teachers carry out psychological intervention on the students according to the prediction results. At the same time, a BP neural network model for predicting psychological crisis is constructed, and the model is compared with the commonly used gray prediction model. The results show that the psychological crisis early warning system constructed based on big data technology and BP neural network can quickly and accurately judge the psychological status of students by using the timeliness of big data

technology, with the highest prediction accuracy of 0.976. This shows the validity of the model and the necessity of research. In addition, in view of the problems existing in the current education management of college students, this paper puts forward six countermeasures based on the analysis results: (1) establish a multilevel linkage feedback early warning system, (2) encourage students to actively participate in the construction of psychological crisis early warning, (3) optimize the application mode of technology, (4) cultivate a team of psychological talents with big data technology, (5) integrate data technology development resources, and (6) ensure the data security of the mental health education center to ensure the mental health and physical and mental safety of college students.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest to report regarding the present study.

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· 教育教学改革 ·

任务式教学提升交叉学科人才培养质量的探索

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摘要:针对当前课程教学无法满足培养高质量多学科交叉融合的工程人才需求的困境,本文提出了一种新的任务驱动教学模式。该模式是以传统任务驱动教学理论为基础,添加了不同学科专业背景教师参与任务式教学过程中的融合方法及其实施策略,不仅能实现教学相长、相得益彰的效果,而且能很好地达成交叉学科人才培养的目标。同时,还给出了“思政之盐”完美地溶解到课程任务大餐的方法,助力“三全育人”,用于全面提升交叉学科人才培养质量。

关键词:任务驱动;人才质量;课程教学;教学范式;高等教育

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一、前言

随着新一轮科技革命和产业变革的突飞猛进,科学研究范式正在发生深刻变革,科学与技术一体化程度越来越高,学科之间、科学与技术、科技与产业相互融合和转化更加迅速。为了适应时代变革,培养多学科交叉融合的工程人才正成为当前高等教育的新使命^[1]。而传统的大学教育是以学科为中心的“专才教育”,显然不能满足当前新形势下的社会需求,分科教育必须向多学科教育转变^[2]。但是,开展多学科交叉融合的人才培养面临着许多问题。融合是多学科教育的核心部分,很多问题都和“融合”有关。诸如,具有不同学科背景的教师怎么融合、多学科的教学内容怎么有机融合、实践环节怎么实现学科之间的良好衔接等。而在这些问题中,师资融合最难,也最为关键。

师资融合之所以难,首先是因为教师之间缺乏一个融合的联结纽带。正常条件下,不同学科背景的教师,没有共同的目标和利益,因此,他们没有内在的根本驱动,希望彼此之间发生融合。其次,专业领域的不适和心理的不适。教师由于接受了长期的系统的专业教育,已习惯于专注本专业领域。另外,每位教师都有自己的教学理念和教学方法。因此教师不愿意也不适应这种多学科交叉融合带来的改变。加之彼此之间没有共同的目标和利益,这种不适会更强烈。因此,在没有联结纽带存在的情况下,即使将不同学科的教师组建到一起,他们之间依然独立的,并没有真正地交叉融合于一体。

师资融合最为关键,因为它是一切融合的基础。

如果教师没有形成一个融合的连续体,必会影响人才培养的课堂教学和实践教学两大环节,进而导致人才培养效果不佳。对于多学科交叉的课堂教学,它不是简单地将不同学科的教学材料放入同一门课程,再分别由不同学科背景的教师来讲授,而是将不同的学科有机地融合在一起。如果缺乏内在的驱动和约束,各学科的教师不会积极研讨课程的策划、拟达到的目标、授课方式、成绩评价等。同时,在课程讲授中,也仅仅是从自己的专业角度授课,不会承接前一个学科的教学内容,也不会为下一个学科教学内容做铺垫,因此不能将学科之间的相互联系很好地阐释给学生。对于实践教学,也不是仅仅向学生开设不同学科的实验内容,让学生完成一个交叉学科的课题研究,而是通过让学生完成多学科交叉的实验和课题研究,了解各学科需要解决的问题,掌握多种解决方法,培养多角度看问题、解决问题的能力。如果教师之间没有形成良好的融合,各学科教师将仅限于完成自己专业部分的指导工作。并且由于彼此之间没有很好地转接,很容易导致不知道自己要做哪部分指导工作、需要达到什么目标。

为了能将不同学科的教师组建到一起,并使教师之间形成高度的融合,本文提出了一种新的任务驱动教学模式。该模式是以传统任务驱动教学理论为基础,添加了不同学科专业背景教师参与任务式教学过程中的融合方法及其实施策略,不仅能实现教学相长、相得益彰的效果,而且能很好地达成交叉学科人才培养的目标。

二、任务式教学目标

任务驱动教学法基于建构主义学习理论(Con-

structivism Learning Theory)而发展出来的一种教学方法^[3]。建构主义学习理论强调学生的学习活动必须与任务或问题相结合,以探索问题来引导和维持学习者的学习兴趣和动机,创建真实的教学环境,让学生带着真实的任务学习,以使学生拥有学习的主动权。学生的学习不单是知识由外到内的转移和传递,更应该是学生主动建构自己的知识经验的过程,通过新经验和原有知识经验的相互作用,充实和丰富自身的知识、能力。因此,任务驱动教学法具有建构主义学习理论特征,它将以传授知识为主的教学理念,转变为以解决问题、完成项目任务为主的多维互动式的教学理念;以问题作为载体,将再现式教学转变为探究式学习,让学生处于积极主动的学习状态,然后学生能根据自己对当前问题的理解,运用已有的知识和自己特有的经验提出方案、解决问题^[3-4]。

具体到课程教学的设计过程中,任课教师根据课程目标设计任务,针对所提出的任务,采取示范、讲解等方式,解析任务并给出完成任务的步骤、思路、措施和结果;在此基础上,教师也可以通过任务方式指导学生边学边做,或独立或协作完成各个环节的学习任务,实现“学中做”“做中学”,以达到学生理解、掌握知识与技能的目标。任务驱动教学法并不是简单地给出任务就了事,重要的是让学生学会学习。它的出发点是师生互动,切入点是边学边做,落脚点是调动学生学习的积极性、创造性,尤为强调个性的发挥,因此,它能为学生提供体验实践的情境和感悟问题的情境,围绕任务展开学习,以任务的完成结果检验和总结学习过程等,改变学生的学习状态,使学生主动建构探究、实践、思考、运用、解决高智慧的学习体系。任务驱动的意义就是在学习信息技术的过程中,在教师指导下,学生能紧紧围绕一个共同的任务活动中心,在强烈的问题动机的驱动下,通过对学习资源或知识的积极主动应用,进行自主探索、研究和互动协作的学习与探讨,并在完成既定任务的同时,使学生完成一种学习实践活动。在这个过程中,学生还会不断地获得成就感,可以更大激发求知欲望,逐步形成一个感知心智活动的良性循环,从而培养出独立探索、勇于开拓进取的自学能力。

多学科交叉融合的工程人才最突出的表现是善于运用学习信息技术、各种学习资源进行自主学习并能创造性地解决问题,所以尤其需要这种任务驱动教学法。显然,在交叉学科人才培养中,实施任务驱动教学法是比较好的选择,而不同学科背景的专业教师在任务布置中发挥各种专业优势作用,有利于开展教学合作交流并在融合过程中不断提升个人教学能力,实现高水平育人的目标。由于交叉学科课程涉及不同专业学科知识,需要进行有机融合,对教师本身就是一种挑战并需要他们再学习、研究和创造的,所以向学生布置学习任务时,不同专业背景

合作的教师首先要有任务,即要围绕课程目标,分析讨论并研究如何设计任务、任务内容包括哪些学科知识以及每位教师扮演的角色和参与环节等。每个任务完成后,还要合作进行教学任务效果反思并布置新的任务。当前专业教师基本上都从事过科研活动,这种分配任务式教学对教师来说是非常熟悉的,也是擅长的,所以在从事任务式教学活动中就如同完成科研项目一样,顺其自然、水到渠成。

显然,任务式教学目标就是交叉学科课程所要求的培养目标,但是针对每一个目标任务内容设计上,不同专业背景教师要进行各自任务再分配,做好专业上的任务融合方案。因此,交叉学科人才培养的任务式教学目标包含了人才培养目标和专业教师融合目标,但最终呈现的是人才培养质量目标和师资水平的提升。

三、任务式教学内容设计

(一) 凝练课程内容,融入思政元素

如图1所示,围绕课程目标,首先要把课程内容梳理成任务线条,线条上布置分任务节点衔接不同学科教学内容,同时每个任务线条间形成合理层次性、逻辑关联性,前一个线条任务的完成要支撑第二条线条的任务教学内容,然后第二条再支撑第三条,以此直到全部实现课程教学目标。要求每条任务线条要体现课程中学科交叉的具体内容,而线条间的相互连接要体现能力的提升过程,在每条任务线条中加入思政内容的设计,履行课程育人责任。同时,每条任务线条中有机融合相关学科研究方向,然后教师结合自身长期学术研究的成果与感悟,合理融入学科发展最新成果、最近进展,打破照本宣科、按部就班的传统教学内容,形成高质量任务驱动的教学内容体系。

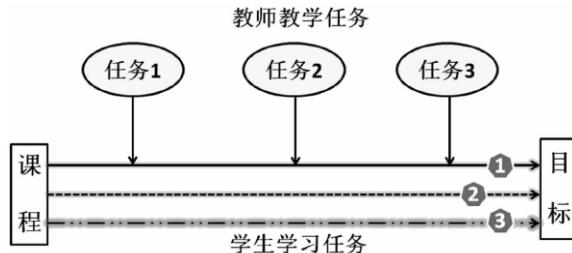


图1 任务式教学目标实施过程

以“太阳能转化原理与技术”这门课程为例,可以确定三个任务线条,即太阳能光热转换原理与技术、太阳能光电转换原理与技术和太阳能光化学转换原理与技术。事实上,在这三个线条中都含有两个以上的学科专业内容,比如动力工程及工程热物理、材料科学与工程、化学工程与技术、物理等,仅由一个学科背景教师讲,最终都会呈现学科内容偏向,并不能让学生很好地感知前沿、触摸前沿,了解太阳能利用的发展趋势。众所周知,目前人类对太阳能

的利用仍极为有限,人类对太阳能高效利用的无限向往亟需突破现有理论和技术瓶颈,显然发现新的太阳能转化方式,从底层设计太阳能材料并发展先进的工程利用技术是太阳能产业中的一体化内容,所以如果学生不能全方位认识该领域,就会影响他们未来对太阳能产业的贡献。

课程思政是“三全育人”的首要任务和重要举措,当前高校教师有义务、有责任教育学生要以实现中华民族伟大复兴为己任,学而思、学而信、学而行,使青年学生更加坚定理想信念,做伟大建党精神的忠实信仰者和坚定实践者。因此,专业教师要发挥课程育人的主体作用,不仅要增强教学吸引力、提升教学实效,还要通过精心设计课程思政内容融入每一条任务线条里面,在任务式教学过程中形成价值引领、能力培养、知识传授三位一体的课程思政良好局面。以“太阳能转化原理与技术”这门课程为例,从课程概论中可引入课程思政元素的要点有①国家“碳达峰”“碳中和”双碳战略;②生态文明建设需要以及习近平总书记提出的绿水青山就是金山银山的生态理念。任务线条设计上,以太阳能光电转换原理与技术任务线条为例,引导学生认识和发现中国光伏产业在国际市场上的成长史,从弱到强再到引领整个过程是如何依靠自身力量和不懈奋斗发展起来的,在任务线条中不仅有思政元素,还有技术知识突进史,可很好实现价值引领、能力培养、知识传授三位一体目标。

(二)提出关键任务

提出具体任务是开展以任务为驱动的教学范式改革创新的关键。不同学科专业背景教师对课程教学内容及对应目标加以充分解析,将课程教学内容分解为若干个核心目标,通过追索核心目标的思想来源、所反映的知识体系、特定现象或所延伸的前沿领域,凝练出该核心任务对应的溯源问题、现象问题或前沿问题,从而将课程教学内容由知识形态转化为任务形态,进而以任务为教与学切入点和抓手,贯穿教学全过程。特别需要注意的是,任务设计要用具体问题把学科间的关键知识联系起来,尽可能密切结合学科发展前沿与趋势,最大化体现教学科研深度融合的特点。关键任务设计要充分考虑学生已有知识基础,能够激发学生兴趣,紧密与现实生活及经济社会发展相结合,注重将课堂教学专业知识与一些社会发展、需要解决的热点问题联系起来,提升任务教学的学科交叉性、前沿性,体现学以致用,在服务我国伟大社会主义建设事业中提高认识和体现价值。

(三)分析任务关联,形成目标逻辑

分析任务之间的关联性是以任务为导向的课程教学范式能否有效实施并取得目标效果的核心。围绕课程目标,对设计制定的任务需进行逻辑梳理,区

分宏观任务、中观任务和微观任务,或学科内课程教学的任务、学科间课程教学的任务、课程能力培养的任务、思政元素融入的任务,要系统厘清任务之间的并列关系、从属关系或交叉关系等逻辑关系,从而构筑成课程任务内及相互间思路明确、逻辑清晰的任务链,有助于帮助和引导学生逐步形成符合逻辑规律的正确思维形式。

任务体系的目标逻辑性乃是逐步引导学生养成严密的逻辑思维模式的良好催化剂,它能够润物无声地促进学生的辩证思维逻辑。教师在任务式教学过程中要善于指导学生学习运用形式逻辑和辩证逻辑的思维形式完成任务,逐步引导学生在履行任务过程中自觉地进行思维的逻辑训练,逐步提高学生的逻辑思维能力,增强逻辑论证的力量,这对于“发现问题—分析问题—解决问题—形成思想”的能力提升具有重要意义^[4]。因而,在运用以任务为导向的课程教学范式过程中,不同专业背景教师要紧紧围绕课程任务进行合作,在任务中实现学科知识和逻辑思维的交叉,并最终构建起课程任务导航图(目标导图),它能够提升以任务为导向的课程教学范式的效果,切实达成课程目标和育人作用。此外,构建课程任务导航图也是拓展以任务为导向的课程教学范式宽度,增强其实效性的一个发展方向。

四、任务式教学策略与方法

(一)面向目标,逐级布设,内容交叉

选择与运用教学策略或方法时必须体现学生的主体地位,确保能促使学生独立思考问题、探究问题、分析问题和解决问题,在润物无声中让学生实现“观察—归纳—形成概念—对新观察进行推理判断—形成新的认识”的任务训练,从而让学生逐渐形成“概念+判断+推理”的正确逻辑思维模式^[5]。任务的中心是课程目标,任务设计要考虑到学生的学习成长过程和自我能力认同过程,任务式教学策略与方法的使用设计必须得到学生的心灵响应,学生有兴趣、教师有动力,教与学双方要统一并相互认同。教师要从教知识向教能力、教思维、教品德转变,学生要从学知识向会观察、会分析、会创新转变。

依据课程目标凝练的任务线条为导向,不同学科背景教师结合学科发展前沿,紧密联系社会经济发展中的热点或瓶颈问题,以教学科研深度融合为前提,按细分任务的方式把不同学科研究思维、认知需求和能力发展等融入整条任务中,能够让学生感同身受学科交叉带来的意义和价值,在任务训练过程中学习学科交叉知识的运用并进行逐渐的能力转化。通过完成课程设计的系列任务,践行课程知识的贯通、思维与能力的训练和强化,逐渐养成基于学科交叉解决问题的思维范式。不同学科背景教师间通过合作、交流并共同在制定任务中进行自然融合,

能精准确立自己所掌握的学科内容在任务中所处的位置、条件和作用,助力教学相长,激发教师的自身认同和使命感。

(二) 协作认同,辨析识理,形成能力

把学生分成若干组执行任务学习是任务式课程教学范式常用的方法。各组学生针对特定任务首先讨论研究出具体解决方案和计划,然后细化出问题任务并在兴趣和强烈的求知欲驱动下各自承担对应问题,展开小组协作活动,最后通过共享资源和信息,确定观点和解决途径,完成团队任务。这样一方面有助于促进学生的协作意识、提升学生的团队精神;另一方面组员间通过对自身已有知识、经验和感悟的交流共享以及对自身观点、认识的输出,不仅锻炼了表达能力,还能进一步提升学生的观察、辨析、归纳能力。在分组执行任务时,教师要激励学生勇敢发表自身观点,引导深化开展各小组之间观点及认识的讨论、解析或辩论,而不是急于做总结、归纳或给出结论,这样有助于让学生获得相互启发、反思不足、拓展思维的良好效果。同时,教师要确保学生的主体地位,对于学生在讨论、辩论过程中可能出现的认识上的偏差或问题要容忍,增强学生的自信心和获得感并感受教师对他们的尊重感和信任感。这样有助于学生理解问题的产生过程、分析过程和解决过程,逐步进入主动辨析识理的自我提升轨道。

教师依据任务特征进行归纳总结的基础是小组任务完成的成效,学生交流、讨论、辩论时产生的思维亮点和思维偏差,特别要注重总结任务中学科交叉的问题。采取的策略或方法:一是肯定评价学生产生的思维亮点,以教师的专业视角拓展亮点,提升其高度和广度,有助于增强学生的学习获得感和自信心;二是深入解析思维偏差产生的原因,明确症结所在,提供准确的理解和认识及其对比分析过程,从而能够帮助学生培养“概念—判断—推理”逻辑思维方式。在学生初步认识架构形成后,教师要以任务的关键问题、学科交叉问题为切入点,进一步全面、系统、深刻地辨析任务计划制定过程、任务解决过程,提炼概念、思想与内涵,使学生达成“认知—认理—认同”的学习过程。这种学习过程的建立,不仅能够让学生理解知识的产生过程、价值与意义,而且能够被学生灵活运用,在学生大脑中形成有效知识,增强学生提出问题与质疑观点的能力。因而,学生的思辨能力和创新能力会得到实质性提升,达成了教师从教知识向教能力、引领价值观转变的目标;让学生从记忆模仿为主转向探究、论证/实践、协作学习为主,实现了被动学习向主动学习的转变。

(三) 思政设计,入脑入心,全面育人

高校人才培养是育人和育才相统一的过程,课程思政建设被作为加强高校思想政治教育、全面提升

高教育教学质量的重要抓手,是高校解决好培养什么人、怎样培养人、为谁培养人的重要组成部分。因此,教育部出台了《高等学校课程思政建设指导纲要》,对高校课程思政建设作出国家层面上的整体设计和全面部署^[5]。围绕高校立德树人使命,课程思政建设要求让每一位教师承担好育人责任,让每一门课程发挥好育人作用^[6],因此课程思政设计是课程教学中重要的也是必不可少的一环。

针对任务式课程教学,课程思政要结合每一项学习任务涉及的学科内容、属性、内涵以及关键科学问题进行设计,要把“思政之盐”完美地溶解到课程任务大餐中自然而然吸收。任务驱动式教学思政内容设计至少要考虑以下三个方面:一是中国共产党百年奋斗形成的重大成就和习近平新时代中国特色社会主义思想,例如新发展理念、人类命运共同体、“五位一体”总体布局、总体国家安全观、共同富裕等重要范畴和命题^[7];二是当今世界处于百年未有之大变局,针对新时代的新问题和新挑战,结合中华民族伟大斗争、伟大工程、伟大事业、伟大梦想及伟大复兴战略,赋予课程知识体系内的思想政治理论时代内涵;三是结合课程内知识技术发展历史、知识技术前沿,梳理我国在相关领域与产业的成功发展史、当下境况和未来挑战,增强学生为中华民族伟大复兴、共同富裕等伟大目标奋斗的使命感和责任感。

思政教育的实施可布置在学习任务中,也可在学生分组讨论、辩论过程中以附加问题形式引导学生主动思考研究。为了能达到满意效果,教师根据需要可以预先提供引导性的线索或资料,让学生正确认识每个国家社会发展、知识积累、文化传承、制度运行所需要的人。此外,在思政教育过程中,要让学生充分发表看法和见解,针对他们给出理由和观点,要善于合理批判和借鉴,有理有据润物细无声的方式化解学生一时的偏见,起到自我反思、自我教育和自我认同的作用。最后,教师要针对任务思政内容设计、编制、实施和评价形成规律性认识。通过规律性认识,才能反映课程思政本质,从理论层面回答课程思政建设中的一系列根本性问题,不断提升课程思政建设水平并产生规范性、指导性的成果。

五、结语

交叉成为学科知识新的增长点和前沿,新的科技革命浪潮的出现催生了很多新产业,世界政治格局也在悄然发生着重大的变化,面对这些新的挑战和机遇,不仅需要新的学科交叉专业人才,还要讲好中国发展的故事,讲好中国特色社会主义的故事,因而培养新时代我国发展相适应的高素质人才重要而紧迫。以任务驱动为导向的课程教学范式是面向立

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时人际关系上也有所收获。之前好多学习比较优秀的学长学姐说,学习西班牙语比较好的方法就是多和外教沟通、交流,课下的时候可以和外教做好朋友,微信上聊天,等等,有时你会发现,外教会给你指正语法上的错误什么的,这是学习语言的一条捷径。

五、结语

在教育对外开放的时代背景下,外籍教师是高校师资队伍建设不可或缺的一部分,外籍教师教学工作高质量发展进程中离不开国家政策的规范,学校制度的健全,外事、院系、教务、质量保障等部门的协同治理,更离不开这个研究领域科学方法的发展和指导。在这方面,教育现象学提供了一个很好的研究视角,它倡导抛开已有的观念和看法,悬置和还原,并保持好奇和追问的态度,直面鲜活的教育世界,让教育现象如其所是地呈现出来,分析、寻找现象背后的教育意蕴,并带来反思和进步。教育现象学的视角将会不断促进外籍教师教学和管理方面的研究发展。

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德树人使命、全面育人的有效教学方法,它具有广泛的适应性,使用方式灵活,形式丰富多样,对不同的课程类型均可以结合自身特色实施应用。

当前,学科层面的交叉尚未形成范式,在培养交叉学科人才时,从事不同学科专业的教师首先要以课程任务建设为目标,有意识地一起设计某一个课程任务并围绕课程目标合作架构各任务间的逻辑层次、先后关系,然后不断总结问题规律并不断反思完善,自然就提升了交叉学科人才的培养质量。教师间良好的合作本身对学生来讲也是很好的示范,同时也有助于促进教师解决学科前沿新问题和发展新技术的能力提升。

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一体化推进研究生培养与 学科建设的方法探析 *

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[摘要]提升研究生培养质量和学科建设水平是当前教育强国、人才强国和科技强国战略实施的迫切需要。在诸多影响因素中，教师是决定研究生培养质量和学科建设水平的关键因素。以导师团队方式合力培养研究生的模式，能够有效汇聚研究生培养所需的师资资源、物质资源和文化资源，能为研究生培养提供多元化、系统化和全局化的指导，也能对研究生给予多环节、多维度的评价，不仅有助于研究生知识、能力、素质的全面提升，而且有助于高水平师资队伍的建设和一流成果的产出，是实现一体化推进研究生培养和学科建设的有效途径。

[关键词]研究生培养；学科建设；一体化推进

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研究生培养处于教育系统的顶层，承载着培养造就德才兼备的高层次人才和推动科研创新进而实现中华民族伟大复兴的重要使命，在科教兴国和人才强国实施战略中承担着重要责任。可以说，研究生培养质量不仅是衡量一个大学也是衡量一个国家的发展水平和发展潜力的重要标志。当前各高校和研究机构围绕国家人才战略部署，积极开展和推进研究生培养改革，着力提升研究生培养质量，虽然取得了一定成效，然而现实中还存在诸多值得反思的问题和新的挑战，^[1,2]如研究生质量与新时代对高层次人才的需求还存在较大差距。因此，探索研究生培养的新思路、新模式依然任重而道远。

学科是高校的基本单元，集师资队伍、人才培养、科学研究和社会服务为一体，是实现高等教育内涵式发展的基本支撑，也是高校各项工作的建设基础。如高等教育专家朱九思先生所说：“学科建设，关系学校的学科结构和学术层次，学术水平与学术环境以及人才培养层次与学生综合素质；关系师资队伍及其学术视野，教学研究条件与学术研究水准，教学效果以

及学生的学风状态和情操陶冶水平。”^[3]为了提升我国高等教育发展水平，推动社会主义现代化强国的建设，党中央、国务院从新时代中国特色社会主义发展的战略高度，做出了“加快建设一流学科”的战略部署。^[4]

作为高校的两大核心战略性任务，研究生培养和学科建设二者之间相互依存，相互促进。^[5,6]学科建设是研究生培养的土壤，也是决定研究生培养质量的关键因素，而且培养出一流拔尖创新人才是学科建设的根本目的。研究生培养会反哺学科建设，是学科建设的发展之基，因为研究生不仅是一支科学的研究的重要力量，有助于促成原创性一流成果的产出，而且承载着对学科知识和优秀文化成果的传承与创新。基于二者间牢固的嵌套关系，高等教育界提出了通过加强学科建设促进研究生培养^[7]或改革研究生培养模式以推进一流学科建设^[8]等对策和路径，然而如何更好地实现二者的融合发展和协同推进，还是一个重要命题。本文在分析研究生培养和学科建设存在的主要突出问题基础上，提出以导师团队方式合力承担研究生培养的模式能够成为一体化推进研究生培养和学科建设的

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有效路径。

一、研究生培养和学科建设面临的挑战

我国当前开启了全面建设社会主义现代化国家新征程，比以往任何时候都更需要创新型、创业型的高层次复合型人才。同时新一轮科技革命和产业变革正在蓬勃兴起，高精尖科技领域竞争尤为激烈，也迫切需要能够解决制约科学发展重大问题的拔尖创新人才，以使我国能够在全球科技创新竞争中站稳脚。然而，目前所培养的研究生还存在以下问题：一是知识面较窄，知识结构较单一。现有的单一学科培养体系和单一导师指导模式，虽然为研究生掌握深厚的专业知识提供了保障，但是在体现知识体系多元性和综合性、增加学生学识广度、拓宽学生视野等方面存在很大的不足。宽广的知识面、综合多元的知识结构是形成独到见解和产生原创性成果的前提。当今新科技和新兴产业复杂程度越来越高，知识面较窄和知识结构较单一的研究生不具备解决新科技和新产业中复杂科学技术问题的能力，很难满足新科技和新兴产业的需求。二是创新能力和综合素质有待提升。研究生导师虽然在不断增强自我的创新意识和提升自身的创新水平，但是导师个人的知识背景、能力特长等存在一定的局限性。因此，单一导师指导模式在培养研究生发散性思维、多维度思考、创新实践能力等方面有潜在的不足。此外，研究生能力的提升虽然与很多因素有关，但是最核心的是研究生主体自身的积极性、自主性等。而现有的单一学科培养体系和单一导师的指导模式很难充分激发研究生的好奇心、求知欲等，在最大限度地挖掘研究生的潜力以促进研究生全面发展方面仍存在很大挑战。

学科建设是一个永不停息、永无止境的过程。加之学科建设的质量不仅关系着学科建设的效果，更重要的是其决定着高校和高校培养的人才能否具备服务国家发展需求、社会经济和人类文明发展需求的能力。因此，学科建设是政府、高校、社会等多方的关注热点和焦点。自国家实施“双一流建设”以来，各高校出台了各种相关政策，学科建设取得了一定成效，学科水平也有了新的提升。然而，学科方向内联不强、交叉融合不够等现象还普遍存在，重大原创性成果缺乏，许多核心关键技术还未突破，存在很多“卡脖子”问题。^[4]如何有效推进和加快学科建设还需深入研究和探索。^[9]

二、教师是决定研究生培养质量和学科建设水平的关键因素

研究生培养和学科建设根本上要依靠教师。^[5, 10]一方面，为了保证研究生培养和学科发展目标、方向、

建设内容等的合理性、科学性及可行性，在研究生培养目标、模式和保障体系，以及学科建设中所涵盖的学科方向和结构、建设目标和建设模式、师资队伍梯队、资源配置等研讨和制定过程中，都离不开教师的参与和出谋划策。可以说，教师是研究生培养和学科建设中顶层设计的核心决策者之一。另一方面，教师既是研究生培养的主体之一，也是学科建设的核心力量，是研究生培养和学科建设的主要执行者和参与者。此外，教师还是研究生质量和学科建设水平的重要评估者之一。因此，教师能力水平将直接影响研究生培养质量和学科建设水平。

三、以团队方式合力承担研究生培养的模式可作为一体化推进研究生培养和学科建设的有效途径

每位教师可以相对独立地完成一定的科学目标，但是对于复杂且重大的科学技术问题仅靠一个人的力量是难以完成的，需要不同专业特长和不同专业知识背景的人共同参与。因此，由目标相同、知识和技能互补的教师组成的科研团队应运而生。将科研团队作为研究生培养的导师团队，以团队方式合力承担研究生培养的模式具有以下突出优势：

（一）能够有效汇聚研究生培养所需的师资资源、物质资源和文化资源

以科研团队作为研究生培养的导师团队，能够汇聚一流的导师资源。科研团队的每位教师，分别具有不同的学术背景，而且在擅长的研究领域有深厚的学术造诣和研究成果。以科研团队作为导师团队，能够引导研究生进入学术科技前沿，而且在研究生探寻关键科学技术问题、开展科学研究和技术突破过程中提供建设性的指导，同时在研究生对科研成果整理、归纳、形成学术论文和学位论文过程中能够给予专业的辅导。

以科研团队作为研究生培养的导师团队有助于为研究生的科学探索和研究学习提供良好的硬件资源。一方面，科研团队在推进科学的研究过程中会不断丰富和持续搭建科学的研究平台，这为研究生开展高水平的创新性研究提供了条件保障。另一方面，科研团队为了推进一流科研成果的产出，会积极开展校企合作、国际合作，为培养研究生的专业技能、实践能力、增强国际竞争力提供了实践资源和国际联合培养资源。

科研团队的锐意进取、热爱科学、团结协作等精神为研究生的成长营造了良好的文化氛围。科研团队中的教师积极探索学科前沿问题，并且通过相互学习，相互启发，激发创新思想，其浓厚的学术氛围为研究生培养提供了创新文化资源。此外，科研团队表现出的严谨认真的治学态度、求真务实的科学精神、献身科学的高尚情操能引导研究生立大志、明大德、成大才、担大任，有助于培养研究生树立“成为堪当民族复兴重任的时代新人”的大格局、大情怀。



（二）能为研究生培养提供多元化、系统化和全局化的指导，也能对研究生给予多环节、多维度的评价

课程学习虽然在研究生培养过程中所占时长较短，但是对培养和提升研究生综合素质和创新能力非常关键。实施“团队指导制”，一方面，可以保证全面、综合和基础性的课程教学质量，另一方面，不同教师的不同教学方法和特点，会增强教学的新颖性和创新性。这些有助于激发研究生主体的积极性、能动性，而且能够使课程教学既有深度又有广度，同时课程资源能够充分呈现前沿性、特色性以及国际性。

合理科学的监督评价对于达成研究生的培养目标也非常重要。以团队方式合力承担研究生的培养模式有助于对研究生培养全过程（包括课程学习、科研工作的开展、学业成果取得3个核心环节）进行监督。同时，多名导师在指导研究生过程中，能够在不同阶段并从不同角度给出多维度的评价，包括知识、能力、素质三个层面，如学习能力、创新能力、独立思考能力、分析问题和解决问题能力、团队合作能力、语言表达能力、写作能力等。

（三）有助于高层次、高水平的复合型人才的培养

如上分析，以团队方式合力承担研究生的培养模式克服了单一导师模式培养出的研究生知识结构单一、解决新兴产业中复杂科学技术问题能力欠缺等不足。培养出的研究生不仅能够具有系统连贯、多学科交叉的知识体系和结构，拥有独立思考的习惯、发现问题的敏锐性、解决问题的主动性、过硬的专业技能、良好的交流表达能力和写作能力，而且会具有高尚的道德情操、强烈的社会责任感。因此，研究生的知识、能力、素质会得到全面发展，其学习质量和持续发展质量都将会得到显著提升。

（四）有助于高水平师资队伍的建设

首先，团队合力承担研究生培养的模式增强了团队教师之间的交流和合作，能够催生更多的创新火花和新颖的研究视角，有助于促成高水平创新研究群体，这将大幅提升科研团队对复杂科学技术问题的攻关能力。其次，研究生培养过程的监管及团队成员联动的激励和约束机制，无形中激发了团队教师不断进取的动力，教师会自觉地要求自己不断增强学术前沿的洞察力和判断力，敏锐地把握学科发展方向，不断提升自身的学术水平。因此，团队教师的科学研究激情、创新潜能得到充分挖掘，教师自身能力将会得到显著增强。

（五）有助于促成一流成果的产出

团队培养研究生的模式既有效提升了导师的水平，同时增强了研究生的创新思维和创新能力，所以科研团队和研究生会选择前沿的、具有挑战性的、产业领域卡脖子的、复杂的科学技术问题作为研究课题，这

些研究有利于促成满足人类社会发展重大需求的一流创新性研究成果。更重要的是，该模式激发了团队教师和研究生的科学研究热情与激情，这会使新的创新思想源源不断的注入高水平科学研究，能够促进高水平研究成果地持续产出。

培养出高质量的人才和打造成一流的学科，进而更好地满足国家和地方的经济建设、社会发展、学科发展及学生个人需求，是高校的首要职能和根本目标。以团队方式合力承担研究生培养的模式不仅有助于形成不同学科知识高度交叉融合，而且能够集结研究生培养所需的师资、平台、氛围等各种资源，有助于提升研究生的培养质量；同时会拓展和加强团队教师间开展更多的深度合作，这将有助于争取到大项目、搭建起大平台、产生重大成果，助力和推进学科的建设发展，因此能够实现研究生培养与学科建设的有机结合，是一体化推进高质量研究生培养和一流学科建设的有效途径。

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