



Study of Research Output and Community Service (PKM) of Lecturers of the Faculty of Sports and Health Sciences (FIKK) of Yogyakarta State University in Supporting Downstreaming

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Article Info :

Received:
01-08-2026
Revised:
23-08-2026
Accepted:
19-09-2026

Abstract

Research downstreaming is an important mechanism for increasing the societal utilization of knowledge, innovations, and practical solutions generated by higher education institutions. Research and Community Service (PKM) activities provide complementary pathways through which academic knowledge can be developed, tested, transferred, and utilized by external users. This study aims to map the research and PKM activities of lecturers at the Faculty of Sports and Health Sciences (FIKK), Yogyakarta State University (UNY), during 2023–2025 and examine their potential contribution to downstreaming. The study employed a descriptive-quantitative approach based on systematic document analysis of institutional records. Data were classified according to study program, year, activity type, potential output, prospective users, and possible utilization pathways, and were analyzed using frequencies and percentages. The results identified 477 activities, comprising 279 research activities (58.49%) and 198 PKM activities (41.51%) across five study programs. Sports Science recorded the highest number of activities with 151 activities, followed by Sport Coaching Education with 127 and Physical Education, Health, and Recreation with 120. The annual distribution also indicated a gradual shift toward a more balanced composition between research and PKM, with the PKM proportion increasing from 36.27% in 2023 to 45.89% in 2025. The findings indicate that research and PKM can support downstreaming through output development, implementation, knowledge transfer, adoption, and sustainable utilization. However, activity volume alone cannot demonstrate downstreaming success, requiring stronger institutional linkages among research outputs, PKM, end-users, implementation pathways, and continued utilization.

Keywords: *Community Service, Downstreaming, Research, Utilization, University.*



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INTRODUCTION

Higher education institutions have increasingly assumed a strategic role in producing knowledge and innovation that not only advances scientific development but also responds to societal needs through applicable and transferable solutions. The contemporary higher education environment has consequently placed greater emphasis on knowledge transfer, innovation, collaboration, and the utilization of research outcomes beyond the academic environment, particularly as universities are expected to demonstrate broader contributions to society (Walsh et al., 2021). This orientation changes the way research productivity is understood because the value of academic activity is no longer adequately represented by the volume of publications, projects, or other conventional outputs. Academic entrepreneurship literature indicates that research can generate broader value when knowledge is connected with external actors and transformed into forms that can be utilized beyond the university (Cunningham et al., 2024). The transition from knowledge production to knowledge utilization requires a systematic understanding of what outputs are generated, who may use them, and through which mechanisms they can be transferred into practical settings. Research productivity therefore needs to be considered together with the possibility that its outputs can be developed, adapted, implemented, or disseminated among relevant users. This perspective provides an important foundation for examining research and community service activities as interconnected components of a broader institutional effort to strengthen the societal and practical value of academic knowledge.

Downstreaming represents a process through which research results are developed toward implementation and utilization so that the knowledge generated by universities can provide wider practical benefits (Ramadian et al., 2026). Such downstreaming is not limited to commercialization because research results may also take the form of learning models, measurement instruments, technological applications, training programs, physical-activity interventions, knowledge-transfer activities, institutional practices, or community-based programs. Evidence on university–industry collaboration demonstrates that the impact of academic knowledge depends substantially on the mechanisms that connect research with external stakeholders and translate academic results into forms that respond to practical needs (Bamford et al., 2024). University–industry linkages also emphasize the importance of institutional relationships in facilitating technology transfer, particularly when research outputs require adaptation, collaboration, and interaction with external users before they can be implemented (Hailu, 2024). The process is therefore influenced by the compatibility between research outputs, institutional support, external needs, and the capacity of researchers or partner organizations to facilitate implementation. Researchers may also possess different motivations for engaging in external collaboration, ranging from academic and professional considerations to broader societal and economic objectives, which makes the pathway from research production to utilization more complex than a simple commercialization process (Mascarenhas et al., 2024). A downstreaming assessment consequently needs to recognize multiple forms of utilization and examine the pathways through which research knowledge can reach users in accordance with the characteristics of the scientific field.

Community service or *Pengabdian kepada Masyarakat* (PKM) occupies an important position within this process because it provides a practical space for applying university knowledge, expertise, methods, and innovations to community needs. Research can provide evidence, models, instruments, and technical knowledge for PKM activities, while problems encountered during PKM can provide empirical input for the development of subsequent research. The effectiveness of community engagement is strengthened when academic activities are connected to mechanisms that facilitate meaningful interaction with communities and generate identifiable social impacts (Kelly & Given, 2024). In the Indonesian higher education context, PKM has increasingly been associated with the translation of academic knowledge into activities that address community needs and create tangible benefits rather than functioning solely as a formal component of the university's obligations (Winarno et al., 2025). Research-based community empowerment further demonstrates that research outcomes can be transferred and adapted through community programs, creating a practical route through which academic innovation reaches users outside the university (Hendrawati, 2023). The interaction between research and PKM can therefore create a continuum in which knowledge is produced through research, translated into applicable forms, implemented through community engagement, and refined through feedback from users. This relationship is particularly relevant for the Faculty of Sports and Health Sciences (FIKK) of Yogyakarta State University (UNY), whose academic fields have strong practical connections with physical education, sport science, coaching, fitness, physical activity, health, and community development.

The research and PKM portfolio of FIKK UNY provides a substantial empirical basis for examining this potential downstreaming pathway. Institutional data for 2023, 2024, and 2025 record 477 activities, consisting of 279 research activities and 198 PKM activities, indicating a considerable volume of academic and community-oriented activities that can be systematically mapped. Based on study program, Sports Science records the highest number of activities with 151 activities, followed by Sport Coaching Education with 127 activities, Physical Education, Health, and Recreation with 120 activities, Primary School Physical Education with 49 activities, and Physical Education with 30 activities. The distribution demonstrates that FIKK possesses a diverse research and PKM base across scientific fields, creating opportunities to identify different types of potential outputs and prospective users. Research on research-based downstreaming in Indonesian higher education indicates that successful utilization requires attention to the relationship between research results, community needs, and mechanisms for transferring or commercializing applicable knowledge (Ekwarso et al., 2022). However, the existing FIKK data primarily indicate the number and distribution of activities by year and study program and do not yet provide sufficient information regarding the outputs generated from those activities. The available records therefore cannot directly establish how many activities have produced intellectual property, prototypes, instruments, products, technological applications, learning models, training programs, or other outputs that have reached identifiable users. Mapping these

dimensions is necessary to distinguish between the existence of research and PKM activities and their potential contribution to downstreaming.

The conceptual framework used in this study positions the study program as the scientific context, research and PKM as the activity base, outputs as potential downstreaming assets, users as the target of utilization, and implementation as the principal pathway through which academic knowledge can generate practical value. This framework allows the substantial volume of FIKK activities to be interpreted not merely as evidence of institutional productivity but as a portfolio containing different possibilities for knowledge transfer and utilization. The distinction is important because community service can contribute to institutional performance when its activities are connected to meaningful academic and societal outcomes rather than being treated as independent activities without continuity with research (Sondari et al., 2024). The downstreaming potential of FIKK also should not be restricted to commercially marketed products because academic outputs can be utilized through educational programs, professional training, community interventions, technological applications, or institutional practices. Evidence from research-based community programs demonstrates that downstreaming can occur when research outputs are transferred into community settings and adapted to local conditions even when their primary form is not a commercial product (Mulasari et al., 2019). Similarly, academic instruments and learning-oriented innovations can acquire practical value when they are implemented by teachers, educational institutions, or other intended users rather than remaining solely as outputs within the university environment (Hariyati et al., 2022). The framework therefore provides a basis for identifying downstreaming opportunities according to the characteristics of each FIKK study program and for examining whether research and PKM activities can form connected pathways toward implementation and utilization.

Table 1. Potential Downstreaming of Research and PKM Outputs at FIKK UNY

Study Program	Potential Outputs	Potential Users	Downstreaming Direction
Physical Education, Health, and Recreation	Learning models, instructional media, learning modules, physical-activity programs	Schools, teachers, students, community	Implementation and adoption in educational and community settings
Sports Science	Sports measurement instruments, sports technology, fitness programs	Athletes, sports clubs, sports organizations, community	Implementation and utilization of instruments, technology, and fitness programs
Sport Coaching Education	Training models, coaching programs, performance assessment instruments	Athletes, coaches, sports clubs, sports organizations	Implementation and development of coaching models and performance-support instruments
Primary School Physical Education	Learning models, instructional media, learning modules	Primary school teachers, schools, students	Implementation and adoption in primary physical education

Source: Research and PKM Data of FIKK UNY, 2026

A critical gap remains because previous literature has extensively examined university–industry collaboration, academic entrepreneurship, knowledge transfer, community engagement, and commercialization, yet these areas have rarely been integrated into a faculty-level mapping of research and PKM as a combined basis for identifying downstreaming potential. Existing approaches tend to emphasize particular transfer mechanisms or measurable outcomes, whereas the initial condition of downstreaming, namely the identification of research and community-service portfolios that possess potential for utilization, has received comparatively less systematic attention. Research methodology literature emphasizes that analytical approaches should correspond to the nature of the research problem and the evidence required to construct a defensible interpretation of empirical information (Creswell &

Creswell, 2017). Studies of Indonesian academics further indicate that motivations toward research commercialization may reflect both individual and prosocial considerations, suggesting that the value of downstreaming should not be reduced to commercial returns alone (Safitri et al., 2025). Knowledge-transfer research also demonstrates that formal and informal exchange activities may operate in combination, indicating that research utilization can emerge through multiple institutional and interpersonal pathways rather than through a single standardized mechanism (Zhou & Baines, 2024). These conditions create a need for an analytical framework that can connect the quantity and distribution of research and PKM activities with potential outputs, prospective users, and feasible forms of utilization. The present study is positioned within this gap by mapping the research and PKM activities of FIKK UNY lecturers during 2023–2025 according to study program, identifying potential downstreaming based on the characteristics of each scientific field, examining the relationship between research and PKM, and identifying potential outputs and their prospective utilization. The study aims to establish an evidence-based map of research and PKM as a foundation for understanding downstreaming opportunities at FIKK UNY, with a theoretical contribution to the conceptualization of downstreaming as a continuum extending from knowledge production through community-based implementation to user utilization and a methodological contribution through the development of a structured faculty-level mapping framework that can support future planning, prioritization, and development of research and PKM outputs toward practical application.

RESEARCH METHODS

This study employed an empirical secondary-data design using a descriptive quantitative approach and systematic document analysis to map the research and Community Service (PKM) activities of lecturers at the Faculty of Sports and Health Sciences (FIKK), Yogyakarta State University (UNY), during 2023–2025. The methodological approach was selected because the study examines an existing institutional activity portfolio rather than generating primary experimental observations, while quantitative descriptive procedures enable the distribution and concentration of activities to be represented consistently across study programs and years (Lestari et al., 2022). The dataset comprised institutional records of lecturer research and PKM activities, which were organized according to study program, activity type, and year before being subjected to systematic classification. Each recorded activity was examined to identify its scientific field, potential output, prospective external user, and possible form of utilization, with the classification retained as close as possible to the information documented in the institutional records. The mapping process distinguished research activities from PKM activities while simultaneously examining their potential continuity, particularly where research-derived knowledge, methods, models, instruments, programs, or technologies could be implemented through community-oriented activities. Quantitative research procedures emphasize the importance of systematic organization of empirical information according to the research objectives, supporting the reproducibility of the classification and descriptive analysis applied in this study (Creswell & Creswell, 2017).

The validation and evaluation procedure focused on the consistency, completeness, and interpretive relevance of the document-based classification rather than experimental performance metrics. Activity frequencies and percentages were calculated for each study program, year, and activity type to establish comparable measures of research and PKM productivity and to reduce dependence on absolute activity counts alone. The downstreaming assessment subsequently evaluated each activity according to three linked dimensions: the potential output generated, the identifiable external user or beneficiary, and the plausible pathway through which the output could be implemented or utilized. This analytical structure was informed by the principle that research-based downstreaming involves transforming research results into applicable knowledge, methods, models, technologies, or innovations that can reach users and generate practical benefits (Ekwarso et al., 2022). Robustness was strengthened through cross-classification of research and PKM records by study program and year, allowing potential patterns to be examined across different academic fields rather than inferred from a single aggregated institutional figure. The resulting evidence was interpreted as downstreaming potential, not as proof of successful adoption, commercialization, or measurable societal impact, thereby maintaining a clear distinction between documented institutional activity and outcomes that would require independent evidence of implementation or user adoption.

RESULTS AND DISCUSSION

Mapping Research and PKM Based on Study Program

The mapping of research and Community Service (PKM) activities at FIKK UNY during 2023–2025 identified 477 recorded activities across five study programs, consisting of 279 research activities and 198 PKM activities. Sports Science contributed the highest number with 151 activities, followed by Sport Coaching Education with 127 activities and Physical Education, Health, and Recreation with 120 activities. Primary School Physical Education contributed 49 activities, while Physical Education recorded 30 activities during the same period. The distribution shows that the institutional research and PKM portfolio was concentrated in three study programs that collectively accounted for 398 activities, or 83.44% of the 477 recorded activities. This concentration provides an important empirical basis for identifying disciplinary areas with a larger volume of knowledge production and community-oriented activity. From an applied research perspective, differences in activity concentration need to be considered together with the types of outputs that can emerge from each disciplinary field because knowledge transfer is shaped by the characteristics of the knowledge produced and the relationships between knowledge producers and potential users (de Wit-de Vries et al., 2019).

Table 2. Research and PKM Data Mapping for 2023–2025

Information	2023		2024		2025		Total
	Study	PKM	Study	PKM	Study	PKM	
Physical Education, Health, and Recreation	36	22	14	14	14	20	120
Sports Science	39	19	24	21	31	17	151
Sport Coaching Education	33	17	22	14	24	17	127
Primary School Physical Education	10	9	7	8	7	8	49
Physical Education	5	3	10	4	3	5	30
Overall	123	70	77	61	79	67	477

Source: Research Data, 2026

Table 2 shows that Sports Science occupied the largest share of FIKK UNY's recorded activities, with 151 activities or 31.66% of the institutional total. Its portfolio consisted of 94 research activities and 57 PKM activities, indicating a research-to-PKM ratio of approximately 1.65:1. Sport Coaching Education recorded 127 activities, comprising 79 research and 48 PKM activities, while Physical Education, Health, and Recreation recorded 120 activities, consisting of 64 research and 56 PKM activities. The relatively narrow difference between research and PKM in Physical Education, Health, and Recreation is notable because 56 PKM activities represent approximately 46.67% of its three-year portfolio, compared with 26.62% for Sport Coaching Education and 37.75% for Sports Science. This pattern indicates that the connection between knowledge generation and community-oriented activity is not uniform across FIKK, even among programs with similarly large activity portfolios. Such variation is relevant to knowledge exchange because formal research production and engagement-oriented activities may interact through different institutional and professional channels (Zhou & Baines, 2024).

The remaining study programs also demonstrate distinct activity configurations that are relevant to downstream analysis. Primary School Physical Education recorded 49 activities, with 24 research and 25 PKM activities, producing an almost equal distribution between knowledge-production and community-oriented activities. Physical Education recorded the smallest portfolio with 30 activities, consisting of 18 research and 12 PKM activities, but its lower activity volume does not in itself indicate limited downstream potential because output relevance depends on the applicability and usability of the resulting knowledge. The primary-school orientation of one program creates a relatively identifiable user environment involving teachers, schools, and pupils, while Physical Education can connect its outputs with broader educational and physical-activity settings. Research and PKM portfolios therefore need to be interpreted according to both quantitative scale and the institutional environment in which their outputs may be applied. This distinction corresponds with evidence that university engagement can generate impact when academic knowledge is deliberately connected with

community needs, users, and mechanisms for sustained application (Kelly & Given, 2024). A smaller portfolio may consequently contain outputs with a clearly defined utilization pathway, whereas a larger portfolio may require additional screening before specific downstreaming opportunities can be identified.

The program-level figures also reveal differences in the potential forms of output that can be developed from FIKK's disciplinary expertise. Sports Science has a direct relationship with applied outputs such as fitness assessment procedures, sports measurement instruments, exercise programs, performance-support technologies, and physical-activity interventions, while Sport Coaching Education has greater alignment with coaching models, training programs, athlete-development methods, and performance assessment instruments. Physical Education, Health, and Recreation can generate learning models, instructional media, physical-activity programs, and health-oriented educational materials that can be implemented in schools and community settings. Primary School Physical Education has a comparatively specific pathway toward learning models, teaching media, and instructional modules designed for primary education, whereas Physical Education may address broader learning and physical-activity applications. The diversity of potential outputs means that the 477 activities cannot be treated as homogeneous units of innovation because one research record may produce a transferable instrument while another may primarily produce conceptual or pedagogical knowledge. Technology-transfer research similarly indicates that movement from academic knowledge toward practical use depends on linkages among universities, external actors, and mechanisms that facilitate implementation (Hailu, 2024).

The quantitative concentration identified in Table 2 can also be used to determine where institutional downstreaming resources may encounter the largest pool of potential outputs. Sports Science, Sport Coaching Education, and Physical Education, Health, and Recreation together account for 83.44% of the recorded activities, creating a substantial basis for thematic clustering and identification of research outputs that can be connected with subsequent PKM programs. Such clustering is particularly relevant when several activities address similar users or problems because repeated research and PKM activities can provide opportunities for refinement, field testing, adaptation, and wider implementation. Research on university–industry and academic knowledge exchange shows that collaboration and knowledge transfer are influenced by both formal and informal interactions, meaning that output utilization cannot be inferred solely from the existence of a research record (Bamford et al., 2024). The present data therefore indicate a potential portfolio for downstreaming rather than a completed downstreaming process. To establish actual downstreaming, subsequent assessment would need to determine whether activities generated identifiable products, methods, instruments, intellectual property, technologies, implementation evidence, or documented adoption by external users.

From the perspective of Applied Research and Innovation, the study-program distribution provides a basis for differentiating downstreaming pathways rather than applying one uniform model to FIKK. Sports Science can be mapped toward sports technology, measurement, fitness, and health-related applications; Sport Coaching Education toward coaching systems and athlete-performance support; and Physical Education, Health, and Recreation toward educational and community physical-activity applications. Primary School Physical Education has a relatively direct potential user structure involving primary schools and teachers, while Physical Education can support broader educational and physical-activity interventions. The existence of these differentiated pathways is important because academic commercialization and utilization may require specific institutional capabilities, lecturer competencies, product-development processes, and support mechanisms beyond the production of research results itself (Nurhayati et al., 2026). The 477 activities recorded in 2023–2025 therefore represent a measurable institutional knowledge and engagement portfolio whose downstreaming potential can be assessed by connecting activity, output, prospective user, and utilization pathway. The next stage of analysis consequently needs to examine the temporal distribution of research and PKM activities to determine whether this portfolio shows continuity, fluctuation, or changes in the balance between knowledge production and community implementation.

Distribution of Research and PKM Based on Year

The annual distribution of research and Community Service (PKM) activities provides a temporal picture of the academic activity portfolio of FIKK UNY during 2023–2025. Across the three-

year period, 477 activities were recorded, comprising 279 research activities and 198 PKM activities. The annual composition is relevant for downstreaming because research represents a principal source of knowledge and innovation, while PKM provides an implementation-oriented setting in which academic expertise can interact with community needs. The temporal mapping also makes it possible to distinguish changes in the volume of activities from changes in the relative balance between research and PKM. Quantitative descriptive analysis is appropriate for identifying such distributional patterns because frequencies and percentages allow activity concentrations and proportional changes to be compared across observation periods (Lestari et al., 2022). The resulting pattern should be interpreted as an institutional activity trajectory rather than as a direct measure of downstreaming success.

In 2023, FIKK UNY recorded 193 activities, consisting of 123 research activities and 70 PKM activities. This was the highest annual activity volume during the observation period, with research accounting for 63.73% and PKM for 36.27% of the year's activities. In 2024, the portfolio declined to 138 activities, comprising 77 research and 61 PKM activities, while 2025 showed an increase to 146 activities with 79 research and 67 PKM activities. The reduction between 2023 and 2024 was therefore followed by a partial recovery in 2025, although the activity volume remained below the 2023 level. These changes indicate that the intensity of academic and community-oriented activities fluctuated over the observation period rather than following a linear increase. The annual figures also provide a basis for examining whether the composition of the portfolio changed alongside the variation in total activity.

Table 3. Distribution of Research and PKM Based on Year

Year	Amount			Percentage	
	Research	PKM	Total	Research	PKM
2023	123	70	193	63.73%	36.27%
2024	77	61	138	55.80%	44.20%
2025	79	67	146	54.11%	45.89%
Total	279	198	477	58.49%	41.51%

Source: Research Data Processing, 2026

The figures in Table 3 demonstrate that the decline in total activity was accompanied by a progressive change in the balance between research and PKM. Research decreased from 123 activities in 2023 to 77 in 2024 and then increased slightly to 79 in 2025, whereas PKM declined from 70 to 61 before rising to 67 activities. Although research remained the dominant activity type in every year, its proportion decreased from 63.73% to 55.80% and then to 54.11%. Conversely, the proportion of PKM increased from 36.27% in 2023 to 44.20% in 2024 and 45.89% in 2025. The difference between the two activity types consequently narrowed from 53 activities in 2023 to 16 activities in 2024 and 12 activities in 2025. This pattern is relevant to downstreaming because a closer balance between research and PKM creates a more visible institutional basis for connecting knowledge production with implementation, although the activity records alone cannot establish whether the two categories are directly connected.

The increasing share of PKM is particularly important when viewed through the concept of knowledge transfer. In university settings, knowledge can move through formal research collaborations, community engagement, professional interaction, and other exchange mechanisms, meaning that application is not necessarily confined to commercialization or technology licensing (Zhou & Baines, 2024). At FIKK UNY, the increase in PKM from 36.27% of annual activities in 2023 to 45.89% in 2025 indicates a greater relative presence of activities oriented toward external communities and practical implementation. This shift creates opportunities for research-derived methods, models, instruments, training approaches, and educational innovations to be introduced into settings where their applicability can be examined. However, the temporal proximity of research and PKM records cannot be treated as evidence that a specific research result was transferred into a specific PKM activity. The analytical value of the pattern therefore lies in identifying a potential institutional pathway that requires further verification through output-level and user-level evidence.

The relationship between the declining research proportion and increasing PKM proportion also suggests a changing composition rather than simply a change in productivity. Research remained numerically higher across all three years, but the gap between the two categories became substantially

smaller by 2025. This configuration may provide more opportunities for iterative interaction between knowledge generation and community implementation, particularly where PKM activities are designed to test, adapt, disseminate, or apply knowledge generated through academic research. Research on community-based research downstreaming emphasizes the importance of developing research results so that they can be translated into usable knowledge, methods, products, or innovations for identified beneficiaries (Ekwarso et al., 2022). A similar principle is relevant to FIKK because applied outputs in sports, physical education, coaching, fitness, and health can require field implementation before their practical value becomes observable. The annual distribution therefore suggests a strengthening opportunity for research–PKM integration, while the actual strength of that integration must be assessed through the substantive relationship between individual activities.

The 2024–2025 pattern further illustrates why downstreaming should not be evaluated solely from the highest annual number of activities. Although 2024 recorded the lowest total of 138 activities, its PKM proportion reached 44.20%, considerably higher than the 36.27% recorded in 2023. In 2025, the total increased to 146 activities and the PKM proportion reached 45.89%, while research increased only slightly from 77 to 79 activities. The combination of a recovering activity volume and a higher PKM proportion indicates that the institutional portfolio was becoming more balanced in composition even though total productivity had not returned to the 2023 level. Community service can contribute to university performance when it is connected to meaningful engagement and institutional processes that facilitate practical impact (Sondari et al., 2024). For FIKK, this pattern provides an empirical basis for examining whether the increasing proportion of PKM corresponds with research outputs that are suitable for implementation, adaptation, or further development by external users.

Taken together, the 2023–2025 data show that FIKK UNY maintained a substantial research and PKM portfolio while experiencing a gradual shift in its annual composition toward a larger relative contribution from PKM. The 279 research and 198 PKM activities provide a sizeable institutional base for examining potential knowledge-to-application pathways across the faculty. Yet, the data also demonstrate an important analytical limitation: activity frequency establishes the existence and distribution of institutional activities but does not demonstrate output quality, successful implementation, adoption, intellectual property generation, or commercialization. The distinction is important because downstreaming requires additional processes that connect academic outputs with users, development mechanisms, institutional support, and opportunities for continued utilization (Ramadian et al., 2026). The increasing proportion of PKM can therefore be interpreted as an increasingly prominent implementation-oriented component of the FIKK portfolio rather than as definitive evidence of successful downstreaming. The next analysis consequently needs to examine the substantive relatedness between research and PKM activities to determine how far the two activity streams can function as connected components of a downstreaming pathway.

Relatedness of Research and PKM in Supporting Downstreaming

The relationship between research and Community Service (PKM) at FIKK UNY can be examined as a potential pathway connecting knowledge production with practical utilization. Research activities generate findings, methods, models, instruments, and innovations, while PKM activities provide settings in which academic knowledge can be introduced to communities and professional users. The institutional records for 2023–2025 contain 279 research activities and 198 PKM activities, indicating a substantial base for examining the potential interaction between the two activity types. The existence of both activity streams within the same faculty is particularly relevant because FIKK operates in scientific fields with direct application in education, sports performance, coaching, fitness, health, and physical activity. Knowledge transfer is generally shaped by interaction between knowledge producers and users, including processes of adaptation and exchange rather than a simple transfer of completed research results (de Wit-de Vries et al., 2019). The analytical focus therefore needs to move from the number of activities toward the extent to which research outputs can be connected with implementation-oriented activities and identifiable users.

The potential relationship can be represented through a pathway in which research functions as the initial source of knowledge and PKM operates as one possible mechanism for implementation. A research activity may generate a finding, method, model, instrument, or innovation that requires further development before it can be applied in a practical setting. The development stage may include refinement, contextual adaptation, field testing, preparation of user-oriented materials, or conversion of

scientific findings into an applicable program or technology. PKM can provide an opportunity to introduce the developed output to teachers, athletes, coaches, schools, sports organizations, or community groups, depending on the disciplinary characteristics of the output. This process is consistent with the broader concept of knowledge exchange, in which universities use both formal and informal mechanisms to connect academic knowledge with external users (Zhou & Baines, 2024). The pathway is not necessarily linear because implementation feedback may return to the research and development stages for modification and further testing.

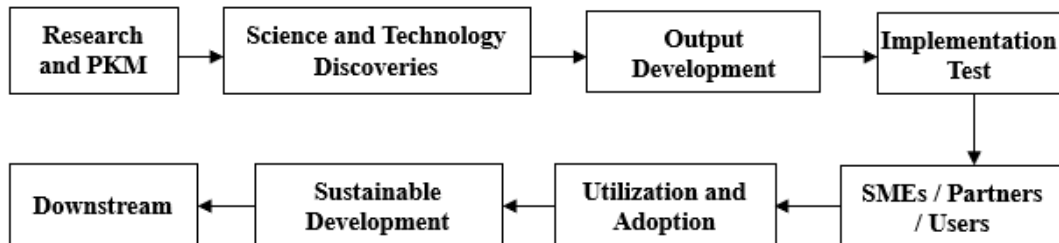


Figure 1. Relatedness of Research and PKM in Supporting Downstreaming

Figure 1 illustrates that research and PKM have complementary functions but should not be treated as automatically connected activities. Research provides the potential knowledge base, while development determines whether the resulting knowledge can be converted into a form that is usable by external actors. PKM then represents one possible implementation channel through which the output can be introduced, demonstrated, evaluated, or disseminated within a relevant user environment. This relationship is important for FIKK because the applicability of an output is strongly influenced by the context in which it is implemented, such as a school for an instructional innovation or a sports organization for a performance-support instrument. Research-based downstreaming involves the development and utilization of research results in forms that provide practical value to identified beneficiaries rather than merely documenting the completion of research activities (Ekwarso et al., 2022). Figure 1 consequently places PKM as an intermediary implementation mechanism within a broader process of output development and utilization, rather than defining PKM itself as evidence of downstreaming.

The potential connection between research and PKM becomes more specific when the output characteristics of FIKK's study programs are considered. Sports Science research can produce sports measurement instruments, fitness assessment procedures, exercise programs, and sports technologies that may be introduced through PKM for athletes, coaches, sports clubs, or community groups. Sport Coaching Education can generate coaching models, training methods, athlete-development programs, and performance assessment instruments that can be implemented through coaching assistance or training activities. Research in Physical Education, Health, and Recreation and Primary School Physical Education can produce learning models, instructional media, learning modules, and physical-activity programs that are potentially applicable through teacher training and school-based implementation. The relationship between an academic output and its prospective user is central to technology and knowledge transfer because application requires interaction between the producer, the output, and the external environment in which the output is used (Hailu, 2024). These disciplinary differences indicate that downstreaming at FIKK should be organized around output–user compatibility rather than through a uniform implementation mechanism.

Table 4. Potential Relationship between Research and PKM in Supporting Downstreaming

Study Program		Potential Research Output		Potential PKM/User	Downstreaming Direction
Physical Education, Health, and Recreation		Learning models, instructional media, physical-activity programs		Teachers, schools, students, community	Implementation and adoption in educational and community settings

Sports Science		Sports measurement instruments, technology, programs	Athletes, coaches, sports clubs, community	Utilization and development of instruments, technology, and fitness programs
Sport Education	Coaching	Coaching models, training programs, performance assessment instruments	Athletes, coaches, sports organizations	Implementation and development of coaching and performance-support models
Primary Physical Education	School	Learning instructional media, learning modules	Primary school teachers, schools, students	Implementation and adoption in primary physical education
Physical Education		Learning instructional media, physical-activity programs	Schools, teachers, students, community	Implementation and adoption of educational and physical-activity programs

Source: Research and PKM Data of FIKK UNY, 2026.

Table 4 demonstrates that the potential relationship between research and PKM can be mapped through three connected elements: the output produced, the user reached, and the direction of utilization. The alignment is relatively direct when a research output addresses a clearly identifiable practical setting, such as an instructional model intended for teachers or a sports assessment instrument intended for coaches and athletes. A PKM activity can strengthen this pathway when it introduces the output to its intended users and generates evidence concerning practicality, acceptability, adaptation, or further development. Community engagement research emphasizes the importance of connecting academic expertise with community needs through structured engagement processes that can generate meaningful social outcomes (Kelly & Given, 2024). For FIKK, this means that the value of a research–PKM relationship should be examined through the quality of the connection between the academic output and the practical problem addressed, rather than through the existence of a research project and PKM activity alone. Table 4 also indicates that each study program possesses a distinct potential downstream route based on its disciplinary knowledge and prospective user groups.

The institutional records nevertheless do not provide sufficient evidence to establish a direct one-to-one relationship between specific research activities and PKM activities. Similarity in study program, year, or general topic can indicate potential relatedness, but it cannot confirm that a PKM activity represents implementation of a particular research output. Verification would require additional documentation, including research titles, output types, PKM themes, implementation locations, user groups, intellectual property records, prototypes, or evidence of adoption. This distinction is important because university–industry and university–community relationships involve multiple formal and informal exchange mechanisms, and the existence of an activity does not necessarily indicate successful transfer or utilization (Bamford et al., 2024). The current findings therefore support identification of potential research–PKM linkages rather than measurement of completed downstream outcomes. A stronger empirical assessment could apply thematic matching between research and PKM records and then trace whether research outputs were subsequently tested, implemented, adapted, or adopted by external users. Such an approach would provide a more rigorous basis for distinguishing ordinary parallel activities from activities that constitute connected stages within a downstream pathway.

The relationship between research and PKM also has implications for the development of an innovation ecosystem at FIKK UNY. Research outputs with practical potential require mechanisms for refinement, validation, user engagement, dissemination, and continued development before they can generate sustained utilization. PKM can contribute to this process by creating real-world implementation contexts, while feedback from users can provide information for improving the output and increasing its contextual suitability. Academic entrepreneurship literature indicates that movement from academic knowledge toward application involves institutional mechanisms and capabilities that support the development and utilization of research outputs (Cunningham et al., 2024). In the FIKK

context, this ecosystem can connect lecturers, study programs, schools, sports organizations, athletes, coaches, communities, and other prospective users according to the characteristics of each output. Digital and innovation-oriented downstreaming likewise requires universities to perform a catalytic role by connecting knowledge production with development, implementation, and external utilization (Ramadian et al., 2026). The research–PKM relationship therefore represents a potential organizational mechanism for converting disciplinary expertise into applied outputs that can be tested, utilized, and further developed.

Overall, the findings indicate that research and PKM at FIKK UNY have complementary positions within a potential downstreaming pathway, although their connection cannot be assumed from activity counts alone. Research contributes the knowledge and innovation base, development transforms selected outputs into usable forms, and PKM can provide an implementation environment involving specific communities or professional users. The pathway becomes stronger when an output has a clearly defined user, responds to an identifiable need, and can be tested or adapted through practical implementation. Institutional support, lecturer capabilities, and product-development processes are also relevant because the production of research results does not automatically lead to usable or commercialized outputs (Nurhayati et al., 2026). The findings support a broader understanding of downstreaming that includes implementation, adoption, adaptation, replication, professional utilization, and further development rather than limiting it to patents or commercialization. This interpretation provides the basis for the next analysis, which examines the broader implications of FIKK UNY's research and PKM portfolio for differentiated downstreaming strategies across its study programs.

Implications of Research Findings for FIKK UNY Downstreaming

The distribution of research and PKM activities across FIKK UNY provides an important basis for strengthening downstreaming as an integrated institutional process rather than as a separate stage after research completion. The 477 activities recorded during 2023–2025 indicate that FIKK has a substantial knowledge-production and community-engagement base that can be connected through more deliberate mechanisms of utilization, adaptation, and implementation. University knowledge transfer is more likely to generate value when research outputs are connected with users, institutional partners, and mechanisms that support the movement of knowledge beyond academic publication (de Wit-de Vries et al., 2019). The relatively large research portfolio can function as a source of evidence, methods, models, instruments, and innovations that are subsequently adapted to educational, sporting, health, and community contexts. At the same time, PKM provides an institutional channel through which academic outputs can encounter practical needs and receive feedback from intended users. Such interaction is important because knowledge exchange between universities and external stakeholders involves both formal and informal mechanisms rather than a single linear transfer process (Zhou & Baines, 2024).

The findings also suggest that downstreaming strategies need to be differentiated according to the academic characteristics of each study program. Sports Science, Sport Coaching Education, and Physical Education, Health, and Recreation collectively account for the largest proportion of activities, creating opportunities to establish program-specific downstreaming portfolios rather than applying an identical model across FIKK. Sports Science can prioritize the development of measurement instruments, fitness interventions, sports technology, and evidence-based performance services, while Sport Coaching Education can emphasize coaching models, training programs, and performance assessment systems. Physical Education, Health, and Recreation can strengthen the utilization of instructional models, learning media, physical-activity programs, and health-oriented interventions in schools and communities. Similar differentiation can be extended to Primary School Physical Education and Physical Education by aligning research outputs with the needs of elementary education, schools, teachers, students, and community-based physical-activity programs. Academic entrepreneurship literature indicates that the pathway from knowledge creation to external utilization can be supported when institutional structures recognize different forms of academic output and provide mechanisms for their development and application (Walsh et al., 2021).

The increasing proportion of PKM from 36.27% in 2023 to 45.89% in 2025 has particular implications for institutional planning. This shift indicates a progressively more balanced composition between research and community-service activities, although the numerical distribution alone cannot establish that research findings were directly transferred into PKM programs. A stronger

downstreaming system would require documentation that identifies the origin of an output, the process through which it was developed or adapted, the target user, and evidence of implementation. Previous studies on research-based community empowerment demonstrate that community programs can become mechanisms for bringing university research into practical settings when the connection between research outputs and community needs is explicitly designed (Hendrawati, 2023; Mulasari et al., 2019). The same principle is relevant to FIKK, where PKM can be positioned not only as an independent community-service activity but also as a testing, adaptation, dissemination, and feedback mechanism for relevant research outputs. This approach would also allow lecturers to document how field implementation generates new research questions, refinements, and opportunities for subsequent innovation.

Institutional support represents another important implication because downstreaming requires resources and coordination beyond the production of academic outputs. Research results that have potential users may remain at the level of reports or publications when there is insufficient support for prototype development, intellectual property protection, validation, partnership formation, dissemination, or product refinement. Evidence on the commercialization of university research highlights the importance of institutional support, lecturer capabilities, and product-development processes in moving health-related research toward external utilization (Nurhayati et al., 2026). Motivation also influences academic engagement with commercialization and other forms of external utilization, meaning that institutional incentives can shape whether lecturers continue developing outputs after the research stage (Safitri et al., 2025). For FIKK, relevant support can include internal screening of research outputs, small-scale downstreaming grants, mentoring for product or program development, facilitation of intellectual property registration, and structured connections with schools, sports organizations, health institutions, industry, and community groups. These mechanisms would transform downstreaming from an individual lecturer initiative into a more systematic institutional pathway.

The findings further imply that FIKK can strengthen its downstreaming capacity by developing measurable indicators that capture stages between research completion and actual utilization. Conventional academic indicators such as publications, citations, and research project counts are important for assessing knowledge production but provide limited information about whether outputs have been implemented or generated value outside academia. A more comprehensive monitoring framework could distinguish outputs such as validated instruments, instructional models, intervention packages, digital applications, training modules, prototypes, intellectual property, and service models from subsequent outcomes such as adoption, replication, institutional use, partnership continuation, or user-generated adaptation. University–industry collaboration research similarly emphasizes the need for impact frameworks that connect collaborative activities with identifiable forms of external impact (Bamford et al., 2024). Community-engagement frameworks also emphasize structured relationships with stakeholders as an important condition for producing sustainable social change rather than treating engagement as a one-time intervention (Kelly & Given, 2024). Such indicators would enable FIKK to evaluate downstreaming as a process and outcome trajectory while avoiding the assumption that every research or PKM activity must end in commercialization.

At the institutional level, the results support the development of an integrated downstreaming ecosystem that connects lecturers, study programs, research groups, PKM teams, external users, and university-level innovation support. The ecosystem can begin with systematic identification of research outputs, followed by assessment of technological, educational, social, or service-utilization potential, selection of appropriate users, field validation, and subsequent scaling through partnerships. University–industry linkage models emphasize the role of coordinated relationships among universities, industry, and other stakeholders in facilitating technology transfer and innovation processes (Hailu, 2024). Academic researchers' engagement with external collaboration is also shaped by institutional and contextual factors, suggesting that downstreaming mechanisms need to accommodate different collaboration patterns and motivations (Mascarenhas et al., 2024). For FIKK, this ecosystem can connect research-intensive programs with PKM-oriented activities while creating opportunities for cross-program collaboration, particularly when a research output requires pedagogical expertise, sports-science validation, coaching application, or community implementation. The downstreaming agenda can therefore be positioned as a mechanism for increasing the practical relevance and institutional value of FIKK's existing research and PKM portfolio rather than simply increasing the number of activities.

The practical implication is that FIKK UNY has a substantial activity base from which a structured downstreaming strategy can be developed, but the next stage requires stronger traceability between activities, outputs, users, and utilization. Research findings can be prioritized according to their readiness, relevance to external needs, feasibility of implementation, and potential for replication or further development. Community-service activities can simultaneously serve as implementation environments in which research-based innovations are tested, refined, and evaluated with users. Previous work on community-based research commercialization and university innovation emphasizes that downstreaming depends on the interaction of research outputs, institutional facilitation, user needs, and mechanisms for continued development (Ekwarso et al., 2022; Ramadian et al., 2026). The implication for FIKK is a shift from counting research and PKM activities toward managing an identifiable portfolio of outputs with clear downstreaming pathways and documented stages of progress. Such a framework can also accommodate outputs whose principal value is social or educational rather than commercial, consistent with broader conceptions of community impact and university performance (Winarno et al., 2025; Sondari et al., 2024). Ultimately, the 2023–2025 mapping should be treated as a baseline for establishing a longitudinal downstreaming system in which promising outputs can be tracked from knowledge production to implementation, adoption, adaptation, and sustained utilization.

CONCLUSION

The mapping of research and Community Service (PKM) activities at FIKK UNY during 2023–2025 identified 477 activities, comprising 279 research activities and 198 PKM activities distributed across five study programs. Sports Science recorded the highest number of activities, followed by Sport Coaching Education and Physical Education, Health, and Recreation, indicating a substantial and diverse knowledge-production base aligned with the scientific characteristics of each program. The distribution across years also shows a gradual shift toward a more balanced composition between research and PKM, with the proportion of PKM increasing from 36.27% in 2023 to 45.89% in 2025. Research functions primarily as a source of knowledge, evidence, methods, models, instruments, and innovation, while PKM provides an important avenue for applying and adapting academic outputs within community and stakeholder settings. The relationship between the two activities creates opportunities to develop a downstreaming pathway through output development, implementation, utilization, adoption, and further development. Such a pathway requires stronger institutional mechanisms to connect promising research outputs with relevant PKM activities, external users, and sustainable utilization contexts. The findings therefore position the existing research and PKM portfolio as an important institutional foundation for strengthening FIKK UNY's downstreaming capacity.

The activity count alone, however, cannot be interpreted as direct evidence of successful downstreaming because the available mapping does not establish whether every research output has been transferred, adopted, replicated, or sustained by external users. Downstreaming assessment needs to move beyond the number of activities toward the identification of specific outputs, their readiness for implementation, intended users, utilization pathways, and evidence of continued application. Strengthening the connection between research and PKM can provide a mechanism for testing, adapting, disseminating, and refining relevant academic outputs according to actual needs in schools, sports organizations, health-related settings, and communities. FIKK UNY can further develop this process through systematic output screening, user identification, field validation, partnership development, and monitoring of post-implementation utilization. A structured tracking system would also make it possible to distinguish research and PKM activities that remain at the knowledge-production stage from those that have progressed toward implementation or sustained utilization. The downstreaming ecosystem can consequently be developed not only around commercialization but also around educational, social, technological, and service-oriented benefits generated for external users. Future mapping should incorporate longitudinal evidence of output adoption, replication, user feedback, partnership continuity, and measurable benefits to provide a stronger assessment of the downstreaming performance of FIKK UNY.

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